ELECTRICAL TIMES

THURSDAY
25 JAN.
1951
SIXPENCE

ADAPTABILITY
HENLEY Consumers' Control Units are now available in 2-unit or 3-unit assemblies, with additional components, giving far wider flexibility and adaptability, complying generally with B.S.1454:1948.
3-UNIT ASSEMBLY, with Supply Intake Unit.
2-UNIT ASSEMBLY, with Supply Intake Unit.
Write for literature Ref. 45
HENLEY
CONSUMERS' CONTROL UNIT
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

Examples of our many activities. The pump impeller is a Panilax Resin Moulding and is supported upon rolls of Mica tape and Empire tape. The punchings include Micanite, Paxolin Laminated and Mica.

m and i

THE MICANITE & INSULATORS COMPANY LTD.
Empire Works, Blackhorse Lane, Walthamstow, London, E.17
Branch offices at Birmingham, Cardiff, Glasgow, Manchester and Newcastle-upon-Tyne, and representatives in most countries throughout the world.

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS and TERMINALS. Distributors of Micaflex-Duratube Sleevings and Micaflex-Durasleeve (Plastics-covered flexible metal conduit).

THESE ARE THE FEATURES WHICH MAKE THIS 'ENGLISH ELECTRIC' COOKER OUTSTANDINGLY POPULAR

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Balanced-heat oven with "Ritemp" thermostatic control

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Attractive finish in two shades of cream vitreous enamel

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Literature of 'ENGLISH ELECTRIC' Domestic Appliances will be sent freely on request.

The ENGLISH ELECTRIC Company Ltd.
Domestic Appliance Sales
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Your breakdown is our business...

We can get those idle machines going again with the minimum delay and, what is just as important, we can keep them going. Thirty years experience as a sort of Industrial Tweeny, specialising in mechanical and electrical repairs to all kinds of manufacturing equipment, in all parts of the country, are a guarantee that we can handle your particular problem with the maximum speed and efficiency.

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NOTE: As we are 'one off' specialists we do not issue a catalogue, but if you are interested and will let us know, we will forward a copy of a booklet describing our activities.

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Registered Trade Mark

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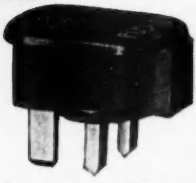

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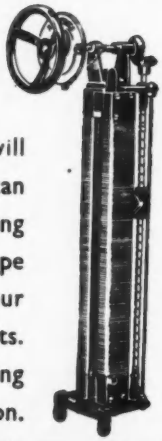

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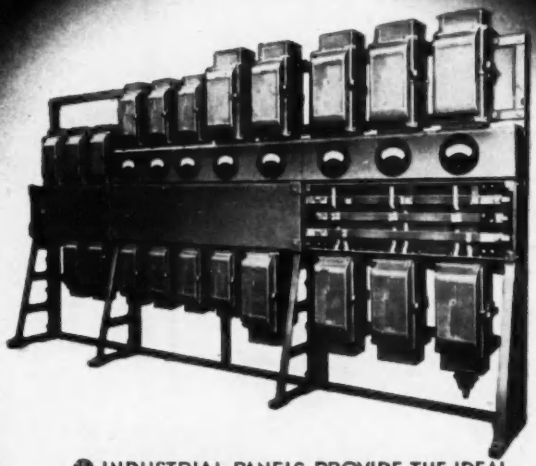

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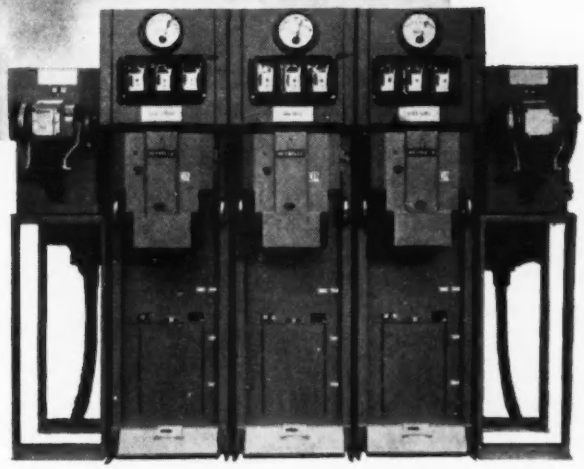

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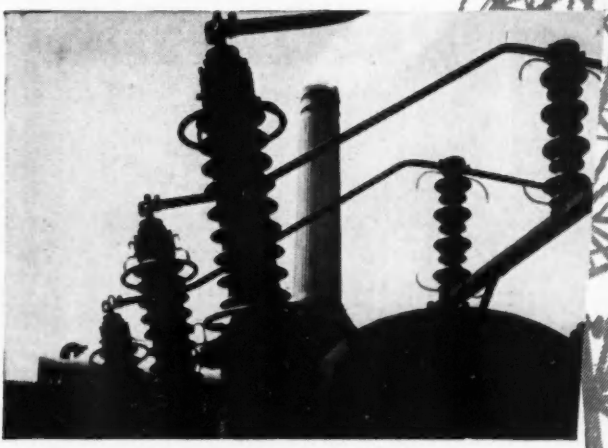
P & G BATTERIES in the public service



P & G Batteries play an important part in maintaining the efficiency of Britain's giant grid system. In countless substations where the flow of energy is broken down to comply with local needs, there you will find P & G Batteries operating vital switchgear or providing emergency lighting should the mains supply fail. The P & G service extends into many spheres, a natural result of 60 years' experience of battery manufacture and development. In round terms here it is. **1.** *Technical Advice and Specifications.* **2.** *Complete equipment and installation.* **3.** *Regular inspection and report.* A discussion of your scheme may help. We are always ready to agree that two heads are better than one.

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50 GROSVENOR GARDENS · LONDON · SW1

2 *heads are better than* **1**

PG10

Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control, Telephones, Supply to Auxiliaries

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Permali Insulating Fish-plate in use on the new 113 lb. F.F.British Railways' Track. Photo by courtesy of the Railway Executive.

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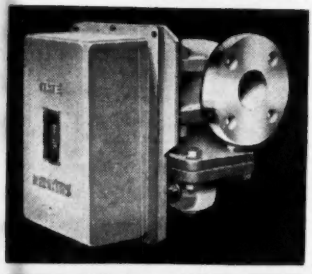
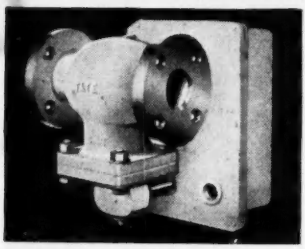
A.C. **VALVES** D.C.





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Sizes : ½", ¾", 1", 1½", 2", 3" and 4"

Pressure Range : 5 lb. □" to 200 lb. □"

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RICHARDSONS WESTGARTH
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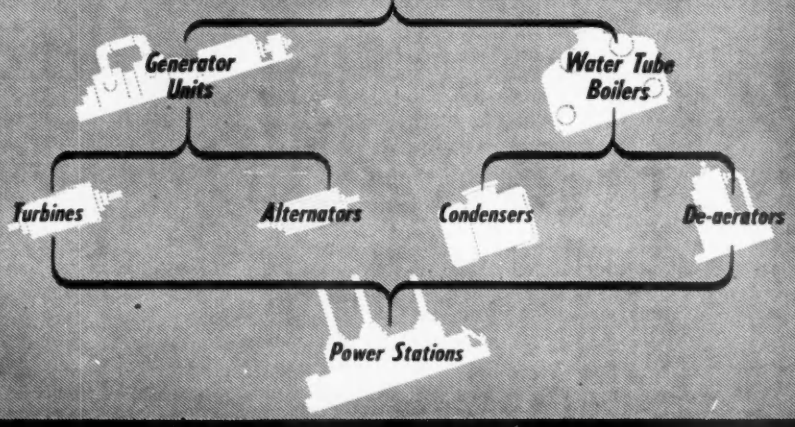
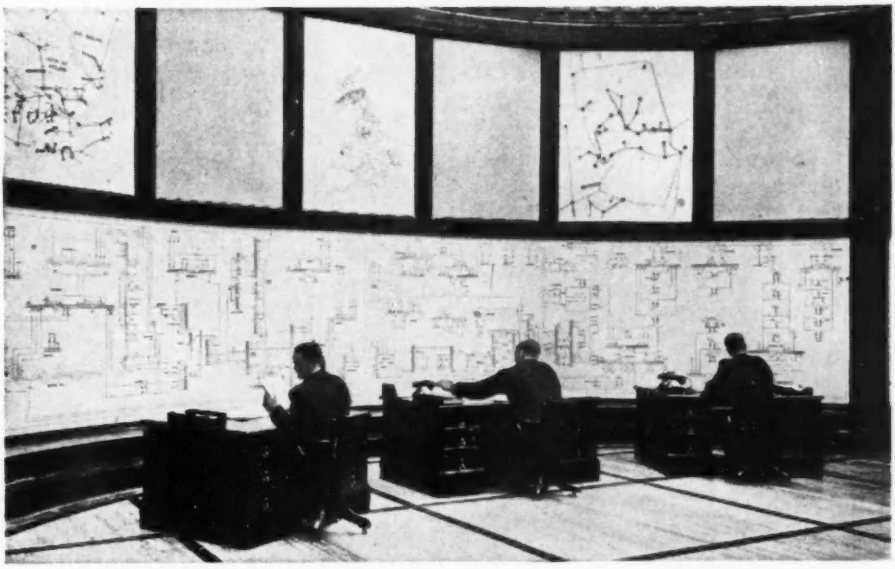


RICHARDSONS, WESTGARTH & CO. LTD. HARTLEPOOL

Visual indication of vital information



Constant visual indication provided by A.T.M. Supervisory Remote Indication and Control Equipment gives the controlling engineer all the information necessary for the supervision and operation of the entire plant in a network.

Distances over which the equipment will operate are practically without limit. Many different conditions may be controlled and indicated over a single pair of wires.

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Some of the facilities provided for the controlling engineer in an Electricity Supply Undertaking equipped with A.T.M. Remote Control Equipment include: starting and stopping of machines, closing and tripping of circuit breakers, raising or lowering of voltages by transformer tap change gear, inter-tripping of circuit breakers in grid networks, warning signals of fault conditions in unattended local sub-stations, telemetering (for total station load, busbar, volt and feeder amps), etc.

ATM REGD TRADE MARK

supervisory remote indication and control equipment

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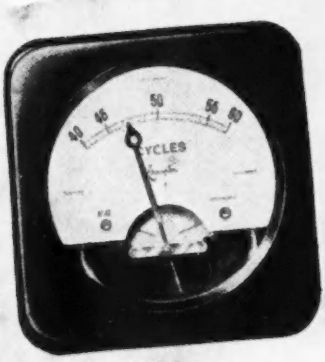
See that power cut coming...



A Frequency Meter gives industrial users clear warning of impending power cuts — says the report of the electricity sub-committee of the National Joint Advisory Council. Be forearmed by being forewarned.

but where the frequency is not much affected, reduced voltage will warn you of impending power cuts. Be sure you have a Crompton voltmeter.

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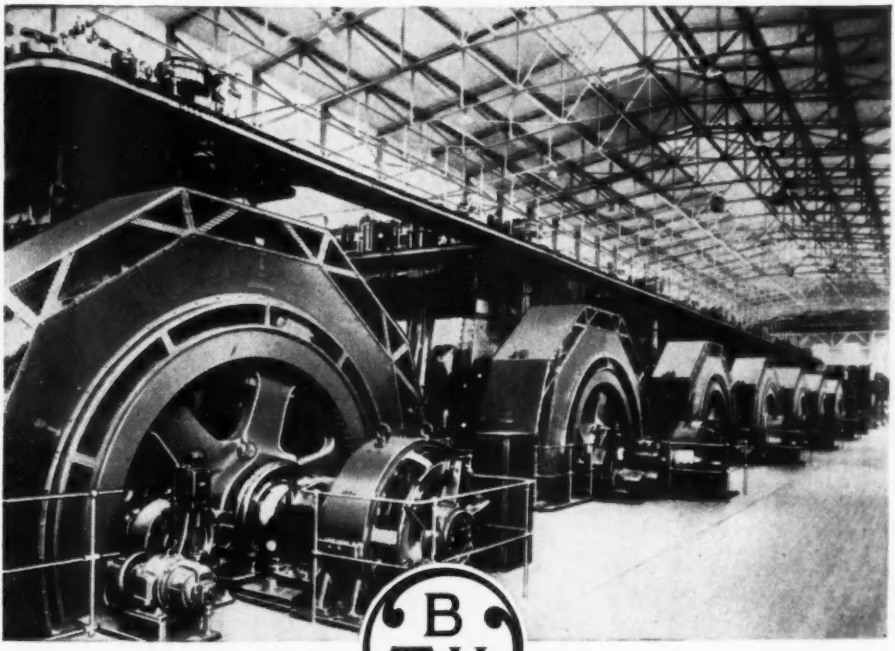

B T-H

Engine-driven Alternators

for any kind of prime mover

BTH supply alternators for use with all sizes and types of internal-combustion and steam engines. The usual method of drive, except in the case of some of the smaller sizes of machines, is by direct coupling to the engine flywheel, the alternator being of the single pedestal bearing type. Particular attention is paid when designing BTH alternators for use with internal-combustion engine driven sets, to ensure that the method of coupling and shaft system are sufficiently rigid to avoid torsional vibrations being set up as a result of the uneven turning moment of the engine.

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BRITISH THOMSON-HOUSTON

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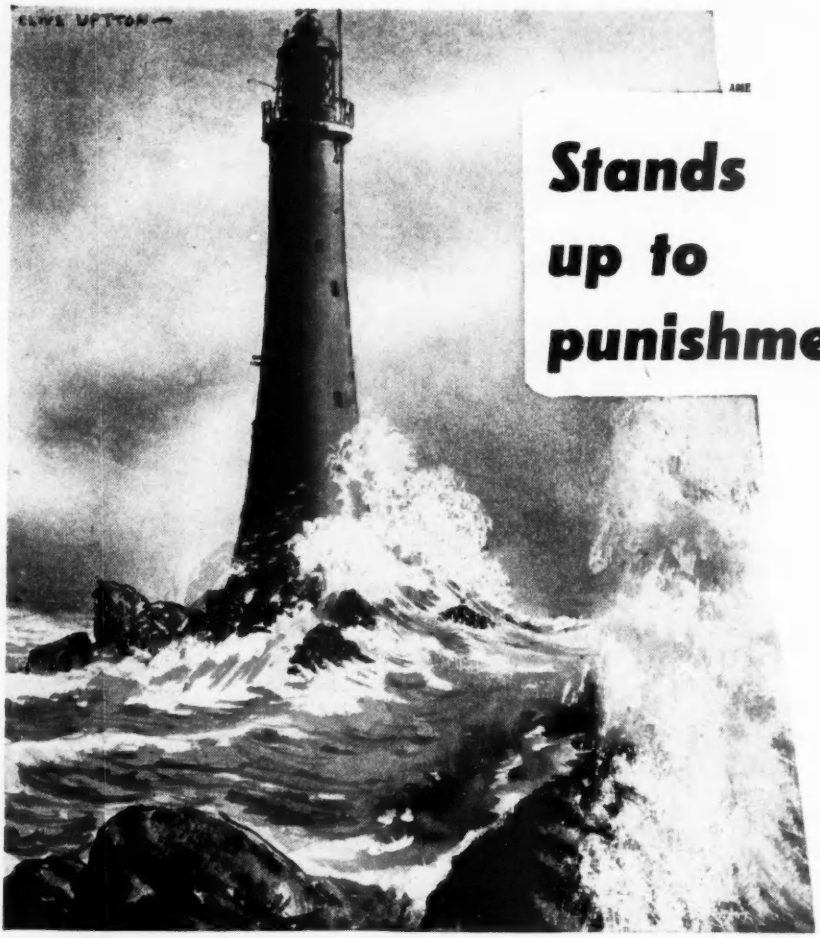
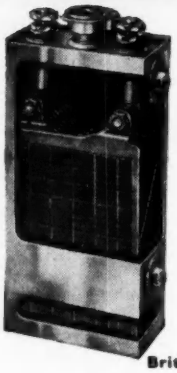


Stands up to punishment



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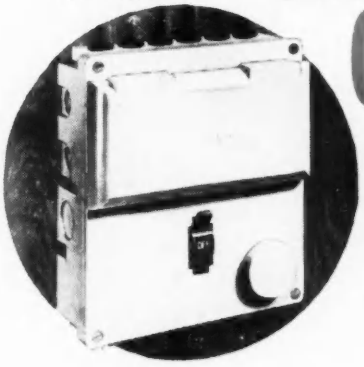
INSULATED SWITCH AND FUSE CHAMBER

(British Patent No. 577848)



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EXTRA SAFETY Insulating case encloses all live parts.

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Available in Cream, Black or Brown.

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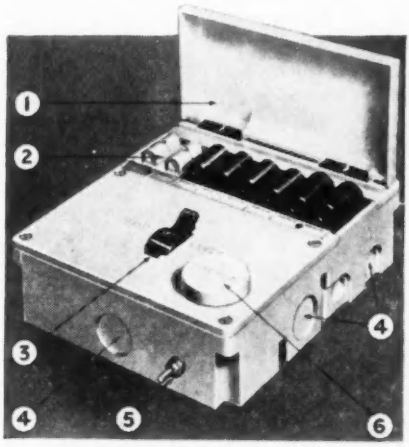

For further information on Insulated Switch and Fuse Chambers send for Publication 290 U.

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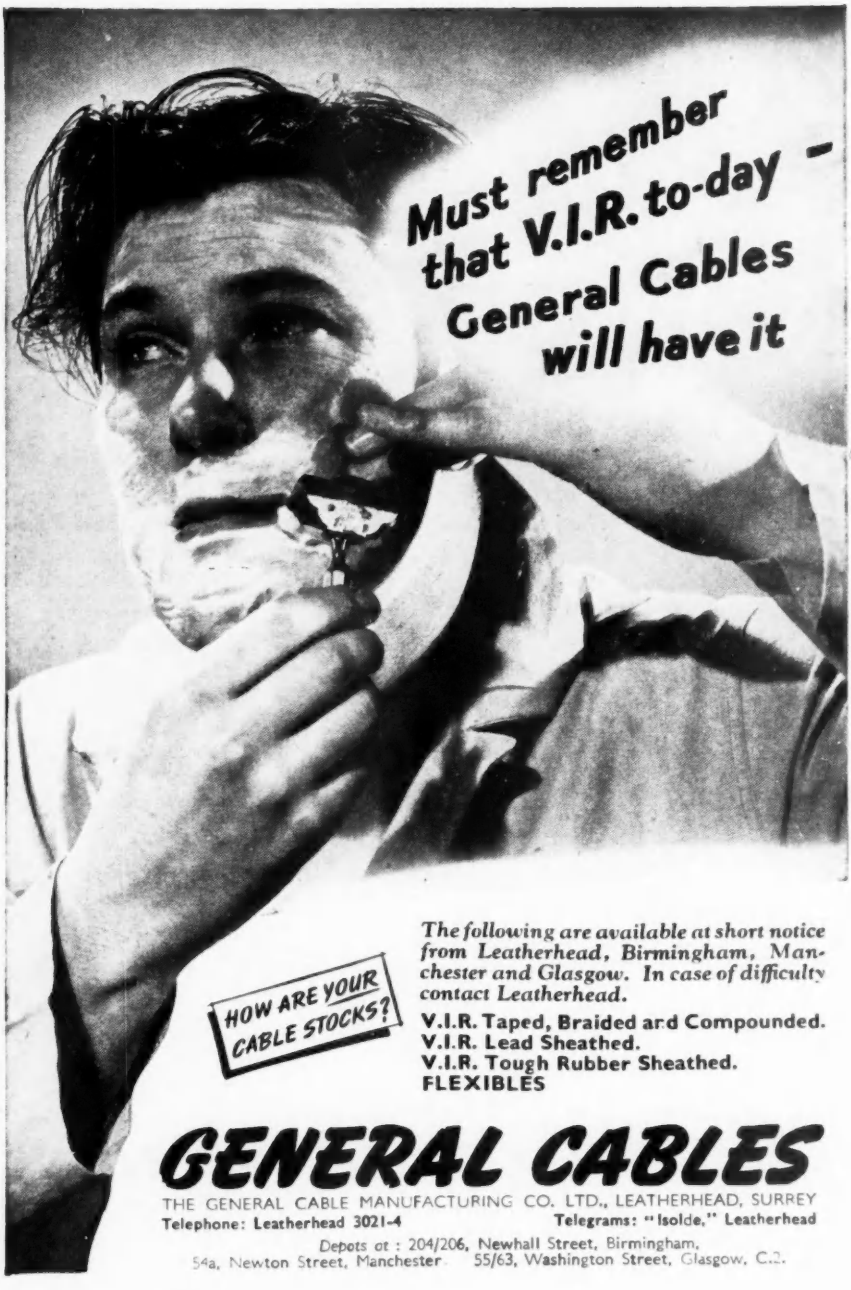

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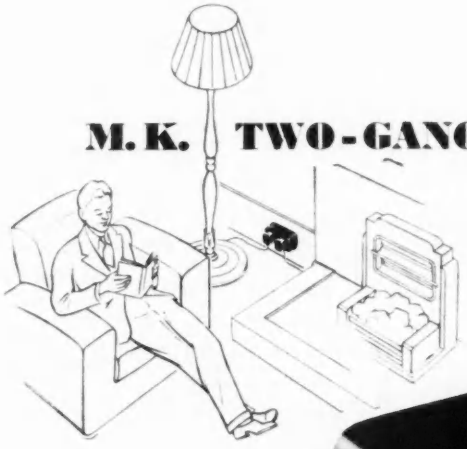
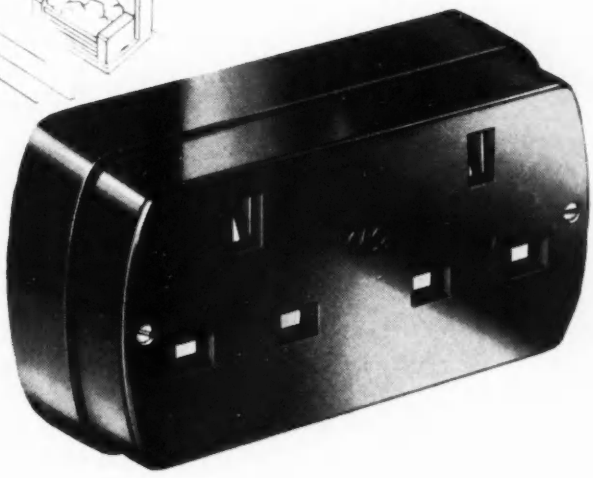


M.K. TWO-GANG SOCKET-OUTLETS

13 amp. Rectangular pin



Rectangular pin "All purpose" 3 k.w. (13 amperes at 250 volts) fused plugs and shuttered socket-outlets are particularly designed for ring main circuits. For A.C. circuits up to 250 volts. The obvious advantages of a two-gang outlet is to have two points in one. Installation costs are often no more than those of single unit outlets. Two points are frequently required and are most desirable in positions such as near fireplaces, when a point for a fire is required and also a second point for the use of either a standard lamp, radio or television. These two-gang units also obviate the use of an adaptor. Made in two types, surface and flush.

M.K. ELECTRIC LIMITED

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Telephone—Tottenham 5151 (6 lines) *Telegrams*—Multiconta, Southtot, London

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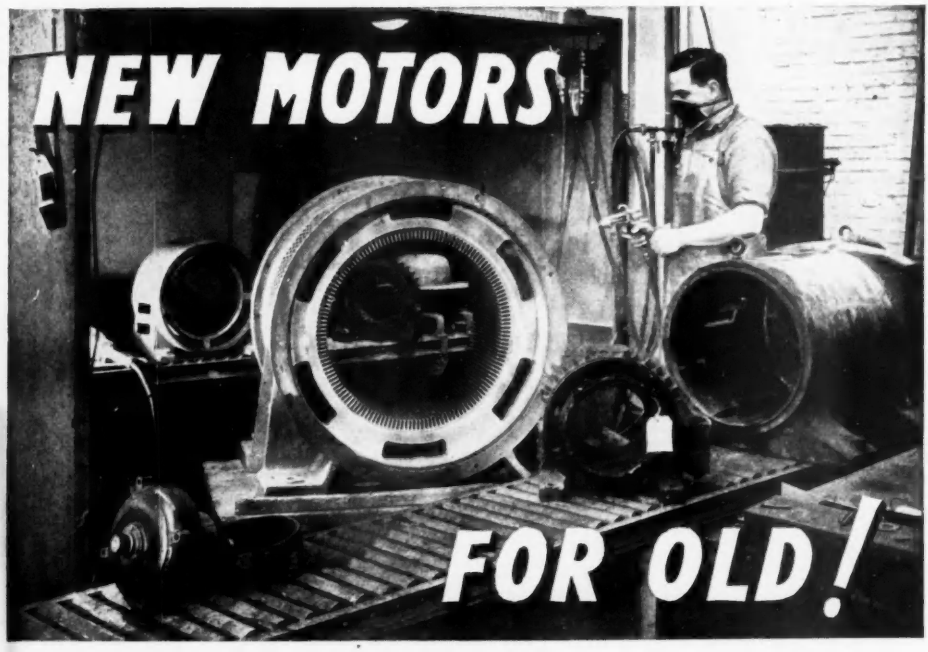

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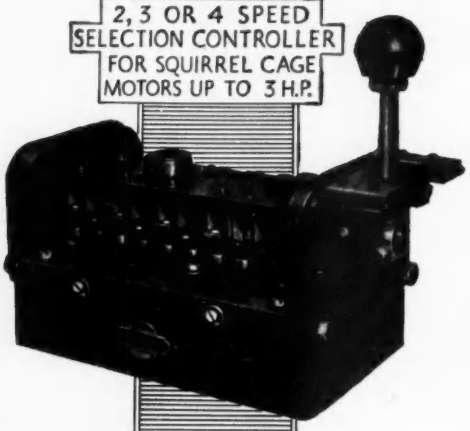

This switch — Catalogue No. 85265 — is designed for the starting and speed control of two-, three-, or four-speed squirrel cage motors up to 3 h.p. 230/550 V. It is also suitable for larger motors up to 7½ h.p., 340/550 V if used in conjunction with a suitable starter.

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Full particulars given on Publication 85265Z1 available on request to Publicity Department, Bedford.

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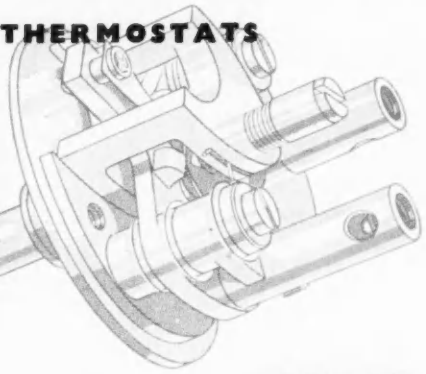

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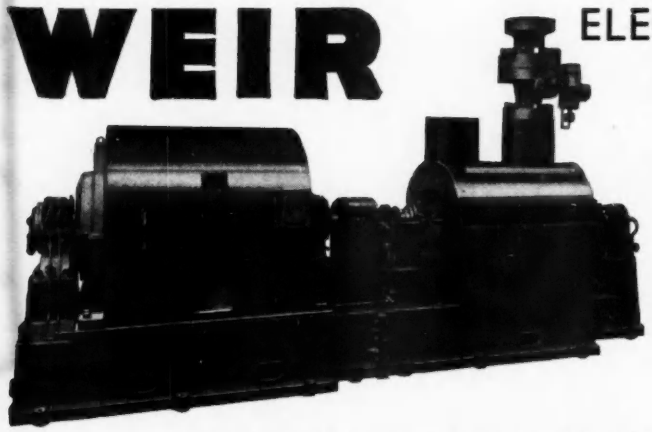

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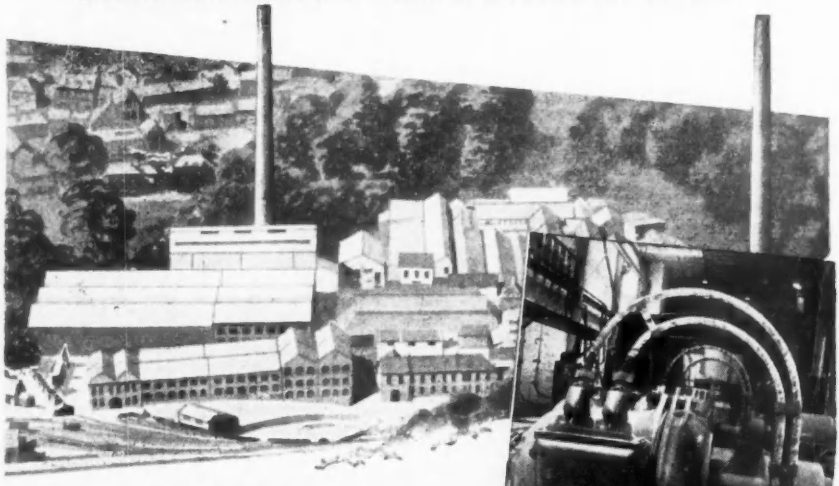

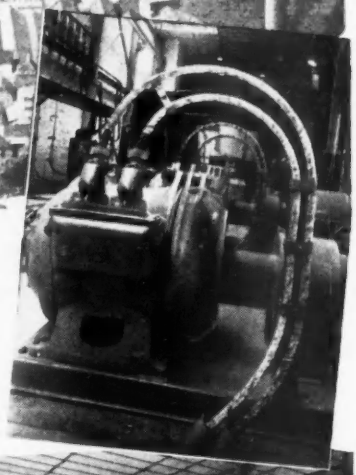

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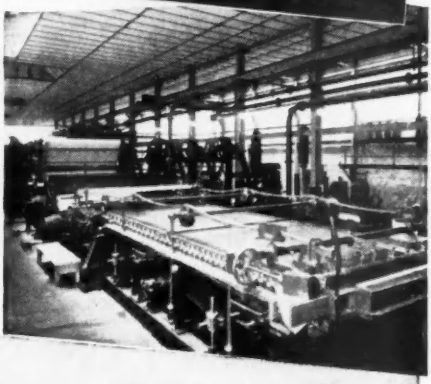

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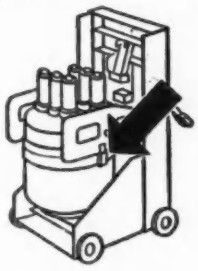

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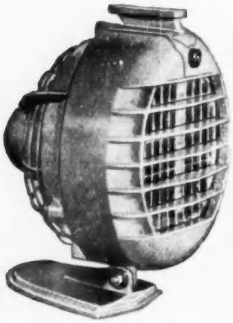

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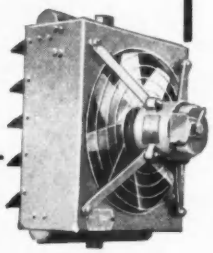

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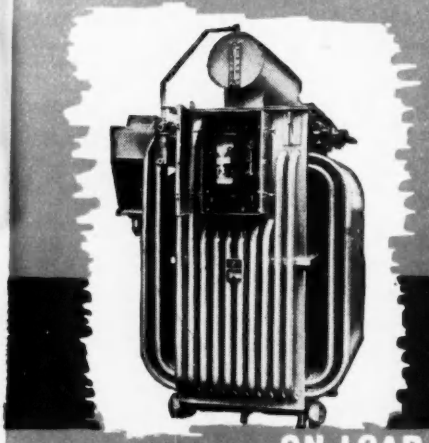

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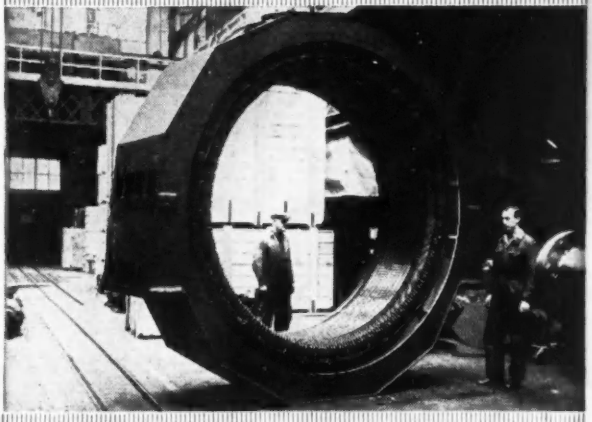

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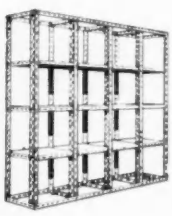

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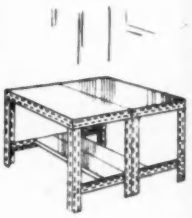

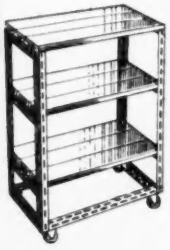

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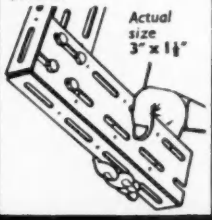

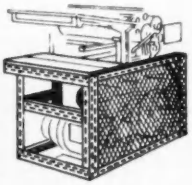

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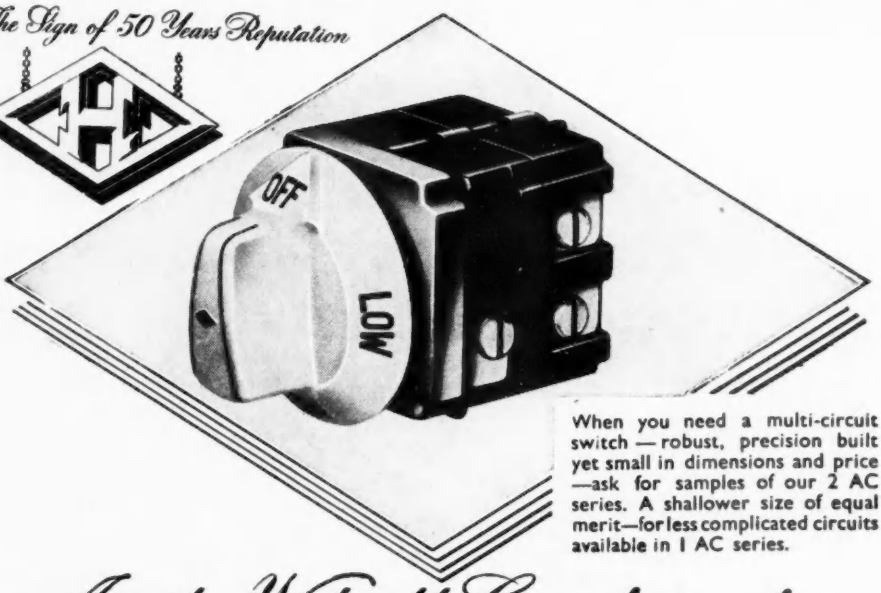

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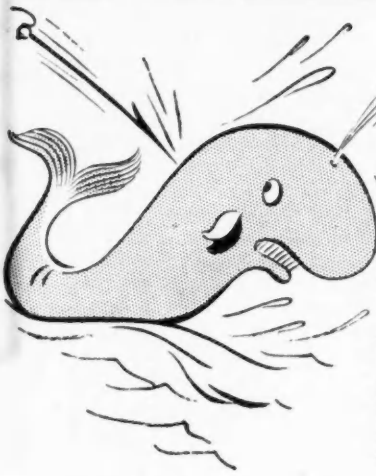

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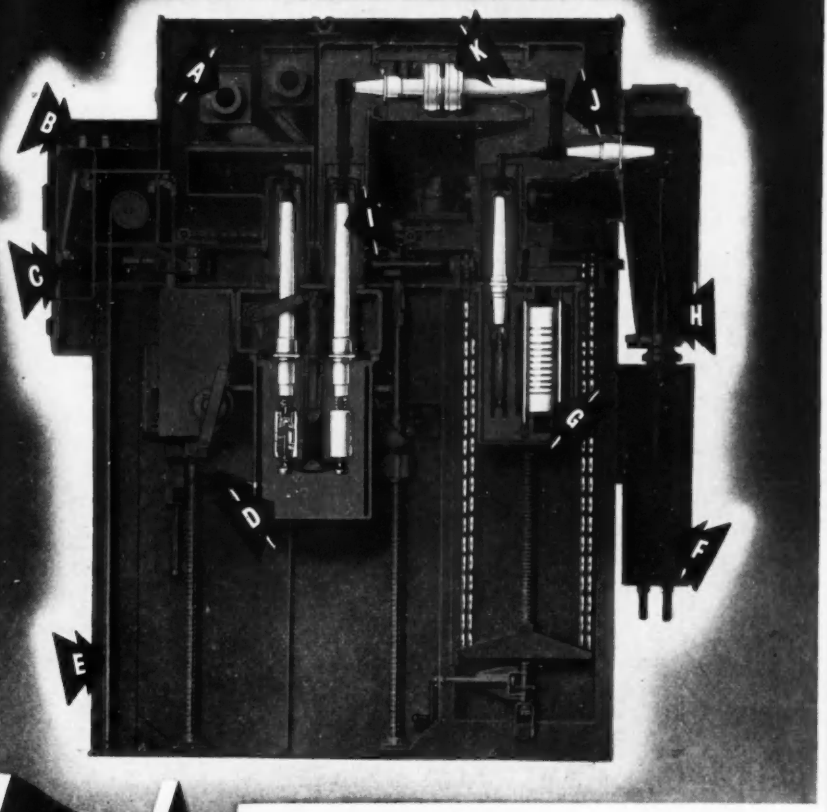

HEAVY DUTY METALCLAD SWITCHGEAR

A Condenser bushing busbars
B Continuous trunking for bus wiring
C Door giving access to the ancillary apparatus
D Low oil content circuit breaker
E Roller shutter enclosing front of the unit
F Multi-core cable box conveniently situated behind unit
G Voltage transformer
H Cable boxes suitable for all types of cable
I Isolating contacts in vertical porcelain spout insulators
J Oil-filled connecting chambers facilitate removal of current transformers
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Fusegear Works, East Lancashire Road, Liverpool, 10

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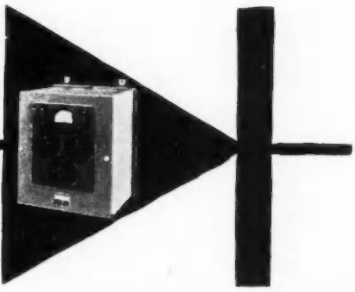

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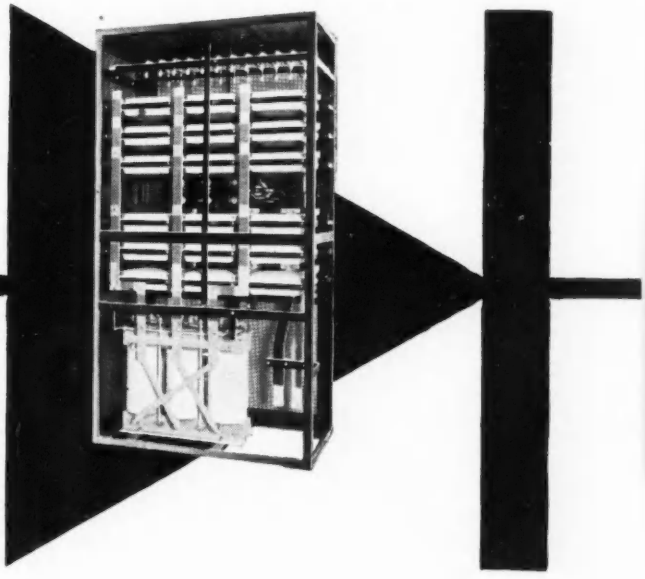

Top illustration: Automatic Battery Charger

Lower illustration: Diesel Engine Starter (back view with panel removed)

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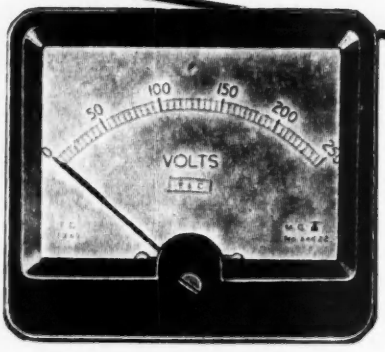

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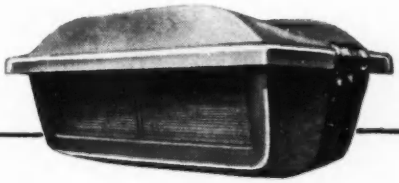
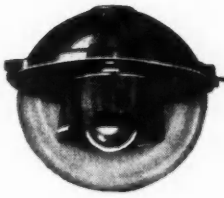
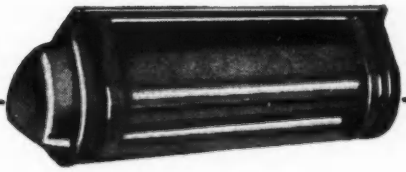


. . . elegant by day



S.S. FIFTY-ONE

BOROUGH



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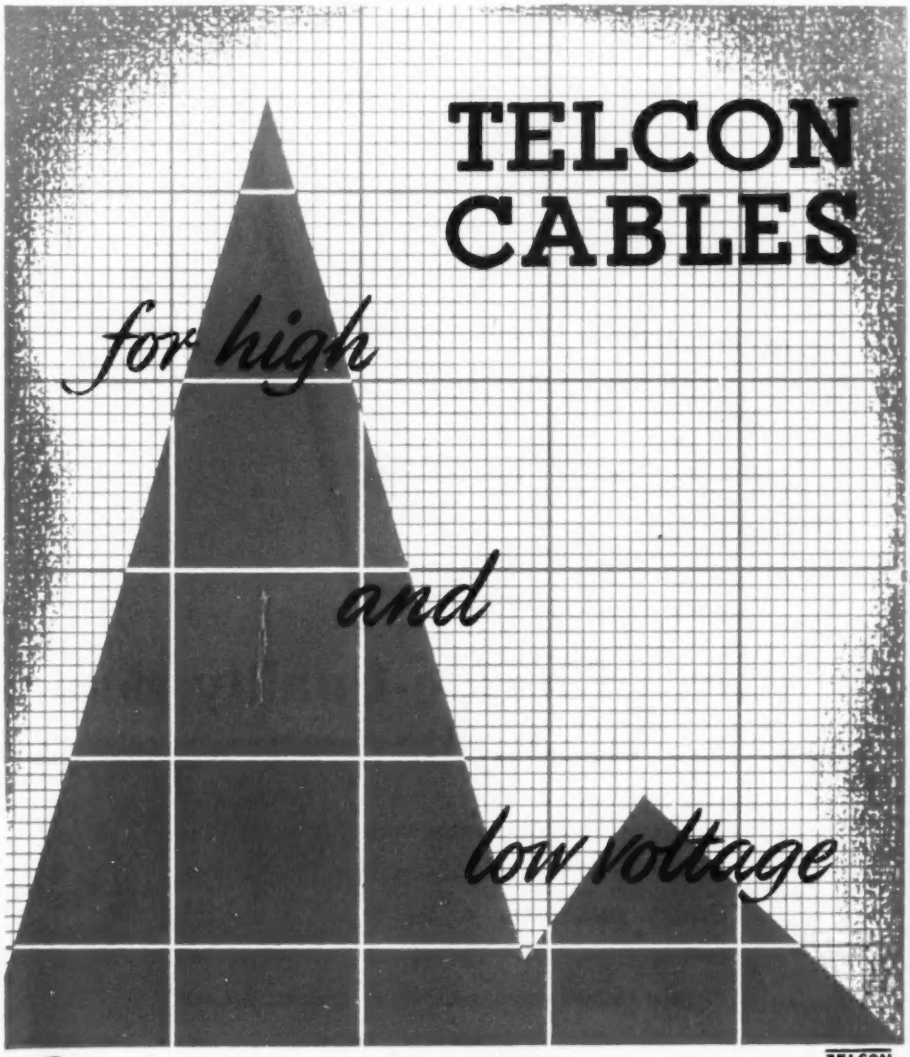

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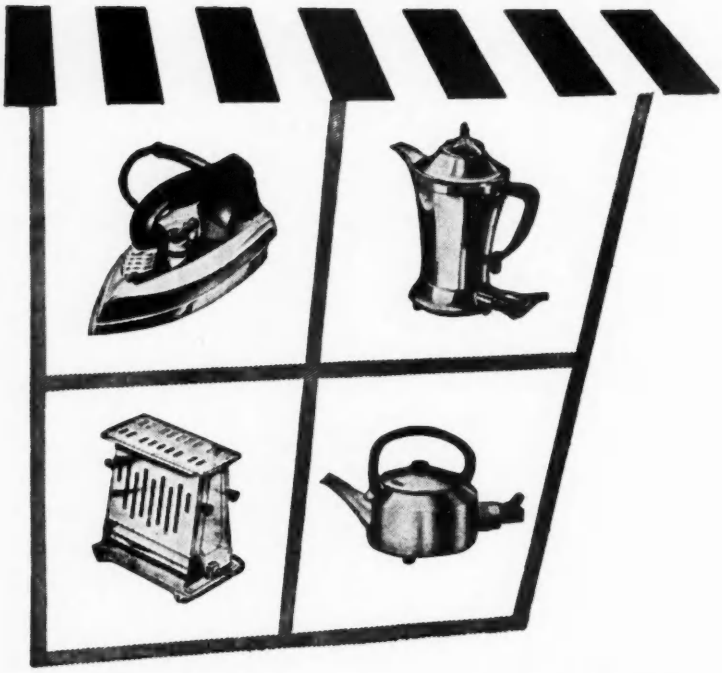

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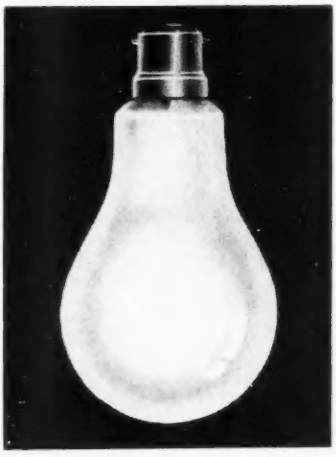

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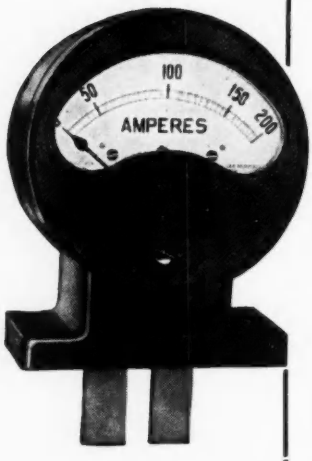

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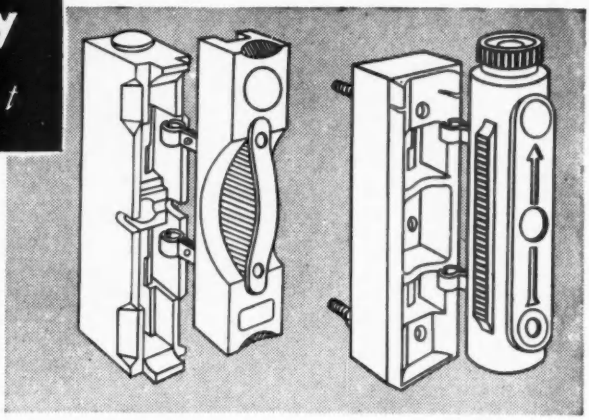

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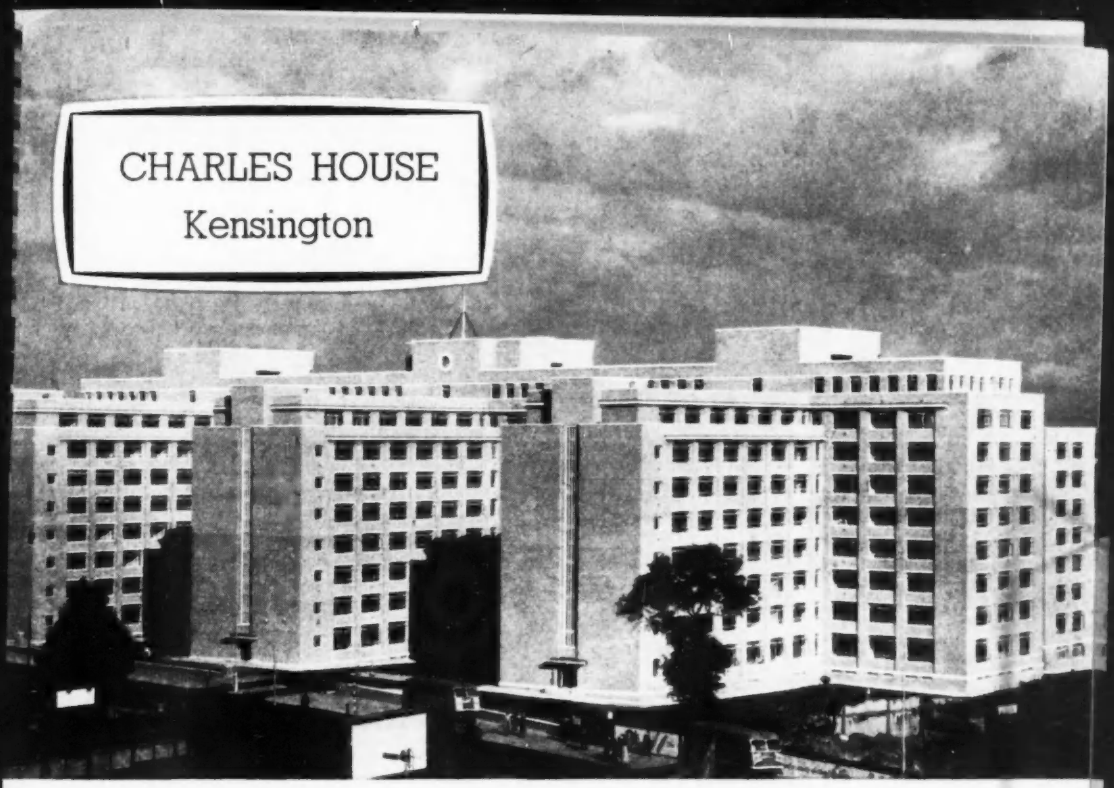

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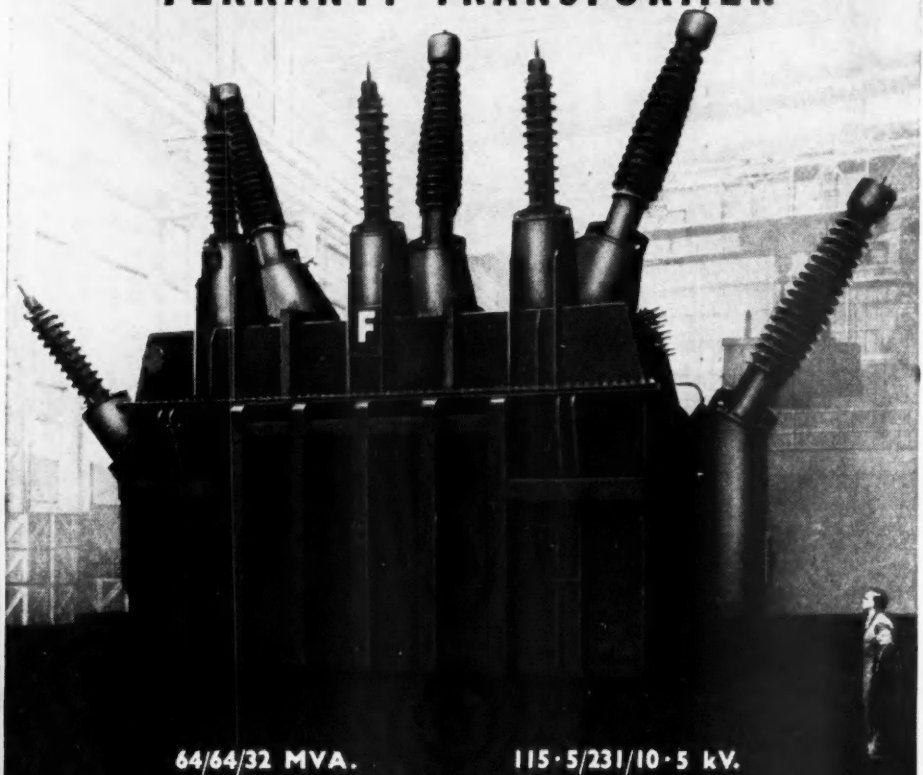

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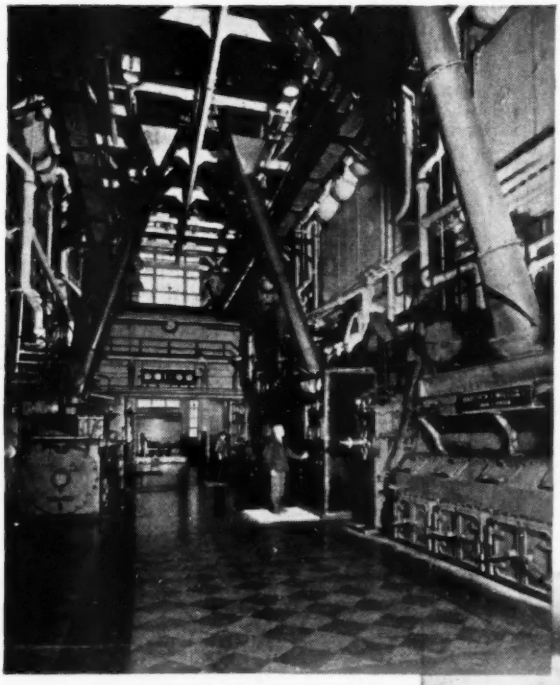

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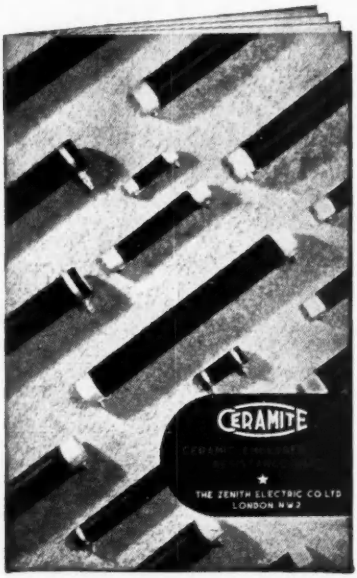

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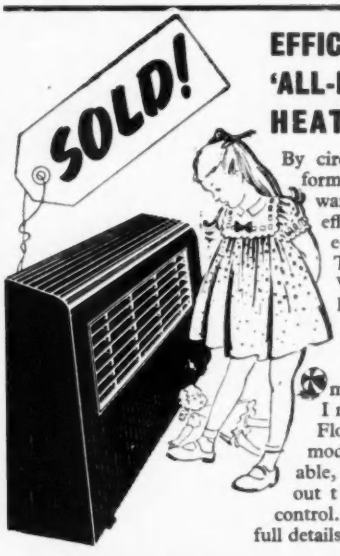

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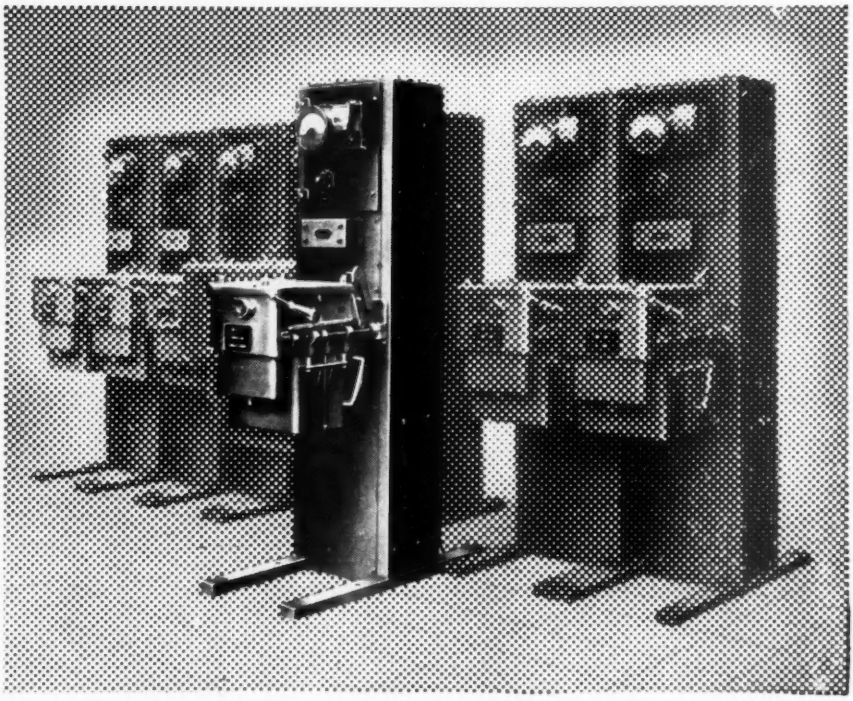

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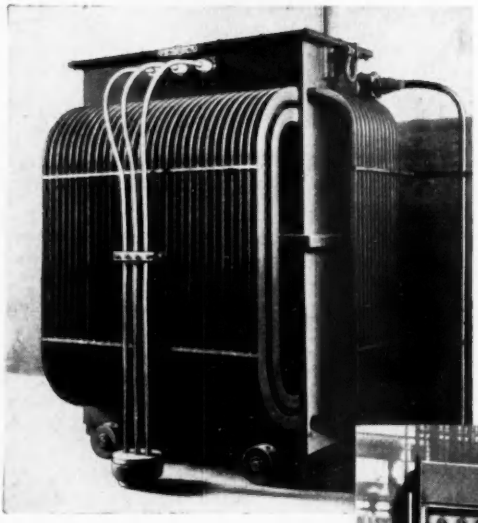

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Editorial

THE MINISTER'S PART

THE second paper to be published by the Acton Society Trust on nationalised industry deals with the powers of the Minister, and is best considered as a continuation of the first, "Accountability to Parliament," on which Meteor commented a few weeks ago. These surveys make increasingly clear what we have all along suspected, that there has been insufficient thought given to the problems raised by nationalisation. In studying the part played by the Minister in the conduct of the Boards, the investigation was handicapped since much of his influence is by direct personal contact, which does not appear to outside observers. His power to issue directives, however, is working in an unexpected way, since it has been found that the threat to issue such a directive is usually in itself sufficient and the Clow surcharge is cited as an example of this. Attention is also drawn to the ambiguous position of the Minister who acts both as the representative of Parliament in supervising the industries, and as the representative of the Boards in the House of Commons—two rôles which it is difficult to combine effectively. The authors have, presumably, felt it is beyond the scope of the paper to speculate on whether a change in Government would affect the Minister/Board relationship. Yet this is likely to be a predominant factor in the development of a workable organisation which will be evolved in the traditional British way, by process of time.

INDIA LOOKS AHEAD

INDIA is making substantial strides in her planning for electric power. The Central Electricity Authority is already in being and it is hoped shortly to set up the Provincial Electricity Boards which will be responsible for co-ordinating regional developments. It is suggested that eventually there will be 11 regions each of which will be self-contained for power development, but with interconnections so as to form an All-India Grid. This is a long way off, however, for India has a major task on the distribution and sales promotion side. This is clearly shown by the sales of electricity which amount to no more than 12 units per head of the population. Rural electrification also is non-existant, for only one half per cent. of the towns and villages have a supply of electricity. Thus it will be many years before load growth reaches a level which demands integrated regional operation. In the more remote future, India may have to turn to increasing large scale transmission in order to exploit the vast water resources of the Himalayas. These extend from Assam in the East, which is separated from Bengal by Eastern Pakistan, to Kashmir in the north, which is at present a cause of dispute with Pakistan.

A WAY TO CHEAT

WHEN interlocks are used on electrically powered machinery, it has to be remembered that there are those who lay claim to the right to overcome the protection they afford; maintenance men can usually trace trouble much more quickly after an examination with the volts on. This poses a difficult problem for the designer of dangerous machinery. He can provide some obvious ways of defeating the interlock, so that the electrician can proceed with his tests, or else, with the paramount importance of safety in mind, he can attempt to keep the interlock proof against all interference. Our columns carried a long correspondence on the relative worth of these alternatives some eighteen months ago, and with the points then raised in mind we awaited with interest any comment that Mr. Fordham Cooper, of the Factory Department, might make in the paper he read before the Institution last

week. A clear opinion came in his reply to the discussion. If some straightforward means of defeating electrical interlocks is not provided, then the maintenance man will apply his ingenuity to discovering such a method. His cleverness will usually prove effective, and the balance of safety lies in the provision of one definite way of cheating that can be used by the electrician. The skill, no doubt, is in choosing that one way.

A DANGER REVEALED

A RELEVANT answer to complaints that supply interruptions during peak hours bring danger to some installations may be found in the philosophy of interlocking. "Failure to safety" is a basic principle in the art of guarding machines, and an excellent precept for all electrical installations. Interruptions in supply have always been an inherent hazard of electrical systems, since at some time mains will fail, fuses blow or protective gear operate because of faults on consumers' apparatus. Good practice demands that such happenings be guarded against by arranging that potentially dangerous apparatus becomes safe when de-energised, and that essential lighting is supplemented by some emergency supply from a separate system. With this background, complaints that power cuts bring danger are seen to reveal past neglect of sound engineering principles. The greater frequency of supply interruptions admittedly accentuates such weaknesses, but they are present, as a potential danger even when power is plentiful.

COST OF LOAD CUTS

THERE are increasing signs that industrialists are becoming concerned with the losses occasioned by load cuts and are endeavouring to obtain some measure of their total magnitude. A census on these lines is shortly to be undertaken in the North West, but the first actual figures we have seen are those issued last week by the Aims of Industry Ltd. These show an estimated loss of fourteen million manhours, this resulting in losses of £1¼ million in wages and £8½ million to firms throughout the country. Unfortunately, the study does not appear to have been conducted on the best statistical lines, and to that extent the figures are liable to question. However, the overall figures do not appear unreasonable, and are possibly of the right order. The loss suffered by firms themselves is the more questionable figure since the basis of estimate is likely to vary considerably between individual concerns. But even though the figures be accepted as correct, they do not help towards solving the plant problem. Perhaps more important than the statistics, is the attention drawn to the ill effects suffered from voltage reduction. These are of a magnitude at least sufficient to merit a closer examination by the supply authorities.

THE TECHNOLOGIST'S PLACE

FEW subjects in recent years have received such widespread attention nor have been the matter for so much discussion, as technical training and the place of the technologist in modern industry. Yet rarely has there been a more stirring statement of the country's need in this field than that by Lord McGowan in delivering the Trueman Wood lecture before the Royal Society of Arts. His basic subject was progress of industry, but in dealing with the future he inevitably came face to face with the need for higher technological training. If we are to increase productivity at a rate not less than 5 per cent. a year, he said, then the supply of graduates trained in applied science must be similarly increased, and this called for a radical shift in the balance of our educational system. The old idea that a career in applied science is inferior in status to other professions must be killed stone dead. This is an admirable sentiment and one which has been a long-standing theme of these notes. Unfortunately this discrimination still exists and there are signs that it is growing rather than diminishing. It is basic in the civil service and as the ideas of this type of organisation spread into large scale industry, nationalised or otherwise, too frequently there is a tendency for the technologist to be regarded as occupying a second place.

Meteor

Circuit-Breaker Ratings

Effect of Neutral Earthing on the Breaking Capacity under Symmetrical 3-phase and Line to Earth Fault Conditions

By A. SALZMANN, Dipl. Ing., A.M.I.E.E.

IT is generally assumed that the maximum fault current at any location of a supply system is caused by a solid 3-phase symmetrical short circuit clear of earth. However, this is not so, since the fault current due to a line to earth fault may exceed the 3-phase short circuit current, particularly in networks with solidly or low resistance earthed neutral close to the earthing point.

It is obvious that if the earth fault current is larger than the 3-phase short-circuit current, the breaking capacity rating of the circuit breaker should be based on the larger fault current value. It is, therefore, necessary to check the symmetrical short circuit current, particularly at locations close to the neutral point of solidly or low resistance earthed power transformers, as the zero phase sequence impedance viewed from the point of the fault is likely to be smaller than the positive phase sequence impedance.

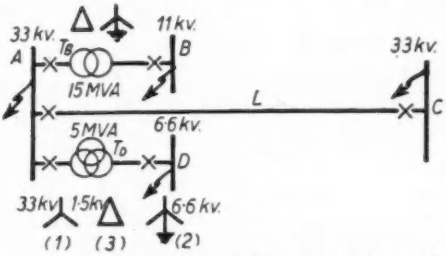


Fig. 1. Schematic one-line diagram of a network showing four short-circuits at A, B, C and D

The proof of the above can be established by comparing the well-known formulae

$$I_F = \frac{100 \times I}{Z_1} \ldots (1) \text{ and } I_F{}^1 = \frac{3 \times 100 \times I}{Z_1 + Z_2 + Z_0} \ldots (2)$$

which evaluate the 3-phase symmetrical fault current I_F and the line to earth fault current $I_F{}^1$ In these equations I represents the current on an MVA base (which is an arbitrary figure) at the voltage at the fault location and Z_1, Z_2, Z_0 represent the positive, negative and zero phase sequence impedance expressed as percentages on the selected MVA base viewed from the point of the fault. It is convenient to assume, that the pos. and neg. sequence impedances of the fault path are equal. This assumption is justified, since the negative phase sequence impedance of the generator is small as compared with the total negative sequence impedance of the fault path. From these formulae it follows (for $Z_1 = Z_2$) that

(*a*) The 3-phase and single-phase short circuit currents are equal if $Z_1 = Z_0$.

(*b*) The earth fault current is smaller than the 3-phase symmetrical short circuit current if $Z_0 > Z_1$.

(*c*) The earth fault current is larger than the 3-phase short circuit current if $Z_0 < Z_1$.

In order to illustrate the effect of the earthing of the system on the breaking capacity rating of the circuit breaker, let us consider a typical network shown in Fig. 1.

Basic Data

Short circuit duty on busbars A: $150 \angle 83{\cdot}7°$ MVA. Equivalent sequence impedances on busbars A referred to 33 kV.

$Z_1 = Z_2 = 7{\cdot}3 \angle 83{\cdot}7°$ ohms

$Z_0 = 16{\cdot}5 \angle 84{\cdot}7°$ ohms

Impedances as percentage on selected 10 MVA base on busbars A:

$Z = Z_{A1} = Z_{A2} = 0{\cdot}725 + j\ 6{\cdot}65 = 6{\cdot}7 \angle 83{\cdot}7°\%$

Comments: j 6.65 is used for evaluation of faults at B_1 C_1 and D.

$Z_{A0} = 1{\cdot}37 + j\ 15 = 15{\cdot}2 \angle 84{\cdot}7°\%$

Transformer T_B: Rating 15 MVA, voltage 33/11 kV. Connections: Delta/Star. Earthing: Solidly earthed neutral. Reactances as percentage on 15 MVA base $x_B = x_{B1} = x_{B2} = x_{B0} = 10\%$. Reactances on selected 10 MVA base: $X_B = X_{B1} = X_{B2} = X_{B0} = (10/15) \times 10 = 6{\cdot}66\%$.

Note: The positive, negative and zero sequence reactances are equal.

Transformer T_D: Rating 5 MVA, voltage 33/1·5/6·6 kV, Connections: Star/Delta/Star. Earthing: Solidly earthed neutral. Reactances as percentage on 5 MVA base; $x_{12} = 8\%$; $x_{13} = 13\%$; $x_{23} = 4\%$. Reactances on selected 10 MVA base: $X_{12} = (10/5) \times 8 = 16\%$; $X_{13} = (10/5) \times 13 = 26\%$; $X_{23} = (10/5) \times 4 = 8\%$.

Note: The reactances between pairs of windings are designated by double subscripts. Subscript (1) refers to the primary (2) secondary, and (3) tertiary winding.

Transmission line: Single 3-phase overhead line with no earth wire. Reactances to the positive and negative phase sequence current are the same and it is assumed that the zero sequence reactance is three times the positive value.

Sequence impedances:

$Z^1_{L1}=Z^1_{L2}=1{\cdot}2+j\ 3{\cdot}2$ ohms

$Z^1_{L0}=1{\cdot}2+j\ (3\times 3{\cdot}2)=1{\cdot}2+j\ 9{\cdot}6$ ohms.

Sequence impedances as percentage on 10 MVA base referred to 33 kV

$Z_{L1}=Z_{L2}=1{\cdot}1+j\ 2{\cdot}95\%$

$Z_{L0}=1{\cdot}1+j\ 8{\cdot}85\%$.

In the following, only the reactance component will be considered. The calculation is simplified by neglecting the resistance component and the error introduced by this simplication is very small.

Fault Values at Location B

1. *3-phase symmetrical short circuit*. Current due to the selected 10 MVA base at 11 kV:

$I=10{,}000/(\sqrt{3}\times 11)=525$ A.

Reactance of the fault path viewed from (B):

$X=j\ 6{\cdot}65+j\ 6{\cdot}66=j\ 13{\cdot}31\%$.

Fault current: (See equ. 1)

$$I_F=\frac{I\times 100}{X}=\frac{100\times I}{j\ 13{\cdot}31\%}=7{\cdot}49\times I=3960\text{ A}.$$

Short circuit MVA:

$1/1000\times\sqrt{3}\times 11\times 3960=76{\cdot}5$ MVA.

2. *Line to earth fault*. Sequence reactances: In the case of transformers, the sequence reactances $X_{B1}=X_{B2}=X_{B0}$ are equal. (Static device.) Under fault conditions on the secondary side, no current of zero phase sequence is present on the primary side due to the delta/star connection of the transformer. The zero sequence network on the busbar side is therefore open-circuited.

Viewing the sequence reactances from the fault we obtain:

$X_1=X_2=X_{A1}+X_{B1}=j\ 6{\cdot}65+j\ 6{\cdot}66=j\ 13{\cdot}31\%$

$X_0=0+X_{B0}=j\ 6{\cdot}66\%$

Fault current:

$$I^1_F=\frac{3\times 100\times I}{X_1+X_2+X_0}=9{\cdot}1\times I=4756\text{ A}$$

Short circuit MVA:

$1/1000\times\sqrt{3}\times 11\times 4750=91$ MVA.

It follows, that the line to earth fault current is larger than the 3-phase symmetrical short circuit current and consequently the commercial breaking capacity rating of the circuit breaker should be 100 MVA and not 75 MVA. Obviously, if a resistance of certain magnitude is connected between the transformer neutral and earth, the 3-phase and line to earth fault current can be equalised. In this case the breaking capacity rating of 75 MVA will be adequate.

So far it is economically justified, the earth fault current should therefore be limited to a value not exceeding the 3-phase symmetrical short circuit current in order to avoid larger breaking capacity rating of circuit breakers.

Fault Values at Location (C)

1. *3-phase symmetrical short circuit*. Current due to 10 MVA base at 33 kV:

$I=10{,}000/(\sqrt{3}\times 33)=175$ A

Reactance of the fault path viewed from (C):

$X=j\ 6{\cdot}65+j\ 2{\cdot}95=j\ 9{\cdot}60\%$

Fault current:

$I_F=100\times I/X=10{\cdot}4\times I=1820$ A

Short circuit MVA:

$1/1000\times\sqrt{3}\times 33\times 1820=104$ MVA.

2. *Single line to earth fault*. Sequence reactances of the transmission line:

$X_{L1}=X_{L2}=j\ 2{\cdot}95\%$

$X_{L0}=j\ 8{\cdot}85\%$

Viewing the reactances from the fault we get:

$X_1=X_2=X_{A1}\pm X_{L1}=j\ 6{\cdot}65+j\ 2{\cdot}95=j\ 9{\cdot}60\%$

$X_0=X_{A0}+X_{L0}=j\ 15{\cdot}2+j\ 8{\cdot}85=j\ 24{\cdot}05\%$

Fault current:

$$I^1_F=\frac{3\times 100\times I}{X_1+X_2+X_0}=\frac{300\times I}{j\ 43{\cdot}25}=6{\cdot}95\times I=1190\text{ A}$$

Short circuit MVA:

$1/1000\times(\sqrt{3}\times 33\times 1190)=68$ MVA.

This result is obvious. The 3-phase short circuit current ($10{\cdot}4\times I$) exceeds the line to earth fault current ($6{\cdot}95\times I$). The latter must fall off quicker than the 3-phase symmetrical short circuit current at the remote end of the transmission line because the zero sequence reactance of the overhead line is a multiple of the positive sequence reactance.

Fault Values at the Location (D)

1. *3-phase symmetrical short circuit*. Reactances: According to Boyajian the reactances

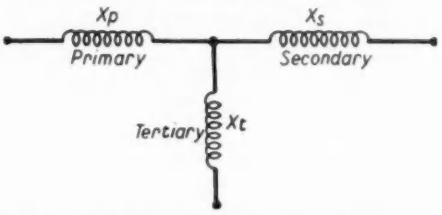


Fig. 2. Equivalent circuit of a 3-winding transformer.

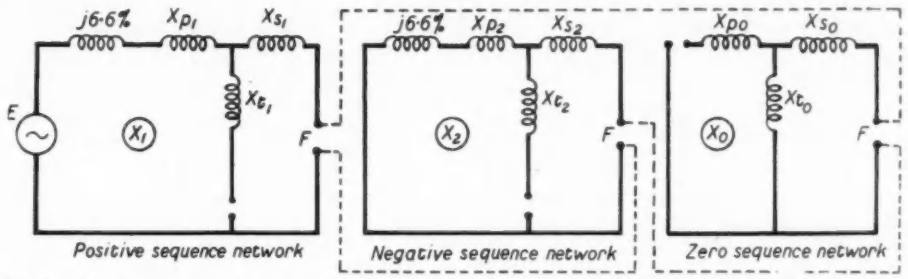


Fig. 3. Phase sequence networks and their interconnections for a line to earth fault at "D" (See fig.1)

X_{12}, X_{13}, X_{23} between pairs of windings of the 3-circuit transformers can be replaced by an equivalent star-connected group as in Fig. 2, whose reactances are:

$$\begin{aligned} X_p &= \tfrac{1}{2}(X_{12}+X_{13}-X_{23}) = \tfrac{1}{2}(j\,16+j\,26-j\,8) \\ &= j\,17\% \\ X_s &= \tfrac{1}{2}(X_{12}+X_{23}-X_{13}) = \tfrac{1}{2}(j\,16+j\,8-j\,26) \\ &= -j\,1\% \\ X_t &= \tfrac{1}{2}(X_{13}+X_{23}-X_{12}) = \tfrac{1}{2}(j\,26+j\,8-j\,16) \\ &= j\,9\% \end{aligned} \qquad (3)$$

However, it should be borne in mind that a symmetrical current caused by 3-phase short circuit sums up to zero in the tertiary winding, consequently X_t remains open circuited for this type of fault.

Viewing the fault path from (D) the total reactance is:

$X = j\,6{\cdot}65 + X_p + X_s = j\,6{\cdot}65 + j\,17 - j\,1$
$= j\,22{\cdot}65\%$

Current due to 10 MVA base at 6·6 kV:

$I = 10{,}000/\times\sqrt{3}\times 6{\cdot}6 = 875$ A

Fault current:

$I_F = 100\times I/X = 4{\cdot}45\times I = 3900$ A

Short circuit MVA:

$1/1000\times\sqrt{3}\times 6{\cdot}6\times 3900 = 44{\cdot}5$ MVA.

2. *Line to earth fault.* Phase sequence reactances: We have pointed out earlier that the sequence reactances of a transformer are equal. This applies also to 3-circuit transformers and the sequence reactances between pairs of windings can be replaced by star-connected groups similarly as shown in Fig. 2. The equivalent reactances representing the positive, negative and zero sequence networks are according to equ. 3.

$X_p = X_{p1} = X_{p2} = X_{p0} = j\,17\%$
$X_s = X_{s1} = X_{s2} = X_{s0} = -j\,1\%$
$X_t = X_{t1} = X_{t2} = X_{t0} = j\,9\%$

Considering the positive and negative sequence networks, it is obvious the branches X_{t1} and X_{t2} are open circuited, as the positive and negative sequence currents which are symmetrical and equal in phase and magnitude sum up to zero in the tertiary circuit.

As regards the zero sequence network, no current of zero phase sequence can flow on the primary side due to the isolated neutral of the transformer on the H.T. side. The zero sequence network on the busbar side is, therefore, open circuited.

Equivalent Phase-Sequence Networks

Denoting by X_1, X_2 and X_0 the pos. neg. and zero phase sequence reactances of the system between the source of supply and the fault location we obtain circuits as shown in Fig. 3.

$X_1 = j\,6{\cdot}65 + j\,17 - j\,1 = j\,22{\cdot}6\%$
$X_2 = j\,6{\cdot}65 + j\,17 - j\,1 = j\,22{\cdot}6\%$
$X_0 = j\,9 - j\,1 = j\,8\%$

Viewing the sequence networks from the fault, the former being connected in series for a line to earth fault we obtain:

Fault current

$$I_F = \frac{3\times 100\times I}{X_1+X_2+X_0} = \frac{3\times 100}{j\,53{\cdot}2} I = 5{\cdot}65\times I$$
$$= 5{\cdot}65\times 875 = 4950 \text{ A}$$

Short circuit MVA:

$1/1000\times\sqrt{3}\times 6{\cdot}6\times 4950 = 56{\cdot}5$ MVA

Fault current in the tertiary winding:

$I_t = I_F^1\times 1/3\times V_{ph}/V_t$.

Substituting in this equ. for $I_F^1 = 4950$ A; $V_{ph} = 6{\cdot}6\sqrt{3} = 3{\cdot}83$ kV and $V_t = 1{\cdot}5$ kV we obtain:

$I_t = 4950\times 1/3\times 3{\cdot}83/1{\cdot}5 = 4200$ A.

Summing up. We can draw the conclusion that the breaking capacity rating of circuit breakers is larger for line to earth fault than for symmetrical short circuit, if the zero phase sequence impedance of the fault path viewed from the fault is smaller than the positive phase sequence impedance.

REFERENCES

1. C. F. Wagner and R. D. Evans: "Symmetrical Components." Mc. Graw-Hill Book Company.
2. "Transmission and Distribution Reference Book." Westinghouse Electric and Manufacturing Comp.
3. "Neutral Earthing of E.H.V. Systems": *The Brown Boveri Review*, July-August, 1948.
4. A. Boyajian: "Theory of Three Circuit Transformers." Trans. I.E.E., 1924, Vol. 43, p. 508.

POWER SUPPLY IN 1950

An Analysis of Ministry of Fuel and Power Returns

IN our review of December activities of the electricity supply industry, we were only able to mention some of the leading statistics of the year which that month ended. Closer attention makes possible some interesting comparisons with previous years.

The industry as a whole began the year with a total installed capacity (m.c.r.) of 13,913 MW, of which 13,588 MW (97·7%) was installed in stations controlled by the B.E.A. At the end of the year, the corresponding total was 15,085 MW, with 14,557 MW (96·5%) accredited to the B.E.A. and the overall increase 8·4%.

The difference between the increase of 969 MW indicated here for the B.E.A. and the total newly installed generating capacity of 1,034 MW mentioned last week, is due to sets taken out of commission, downrated, etc. The increase represents 7·1% of the end-1949 total, as compared with an increase of 5·3% of the end-1948 total achieved in the previous year.

In Scotland the joint efforts of the North of Scotland H.E. Board and the Lochaber Power Co., whose statistics are combined in Ministry of Fuel and Power statements, have produced an even more notable increase in installed plant. During 1949, the total of installed plant fell slightly, whereas last year 203 MW was added, bringing the total up to 528 MW, 63% above the end-1949 value.

Generation

Increased demand, occasioned both by load growth and by weather that was unfavourable compared with the previous year, is again shown in the figures for units generated and sent out. For the year, the total of 55,014 million units generated, is 12% up on 1949: comparison with the 42,619 million units generated in 1947 gives an average increase of 9% in each year. Units sent out, at 51,958 million, gave a similar increase for the year of 12·2%, while the overall ratio sent out/generated is 94·4%.

As between different sources of power, the total generated splits to give 53,307 million units (96·9% of the total), as generated with steam plant, against 2·7% from water power and 0·2% from oil engines.

In B.E.A. stations, energy generated was 53,710 million units, of which 53,023 million units came from steam plant (98·7%) and 513 million units from the Authority's hydro-electric installations. This latter figure, when compared with the 1949 total of 395 million units from the same plant, shows the effect of the wetter weather.

In the North of Scotland area, there was a similar large increase in energy generated from water power during 1950. The total was 970 million units, against 780 million for 1949. In this area water power accounted for 74·3% of the total electrical energy, with 21·6% coming from steam plant.

Output of water power varied very considerably from month to month. The B.E.A. had the greatest range proportionally, with a low of 12 million units in June and a high of 76 million units in September. Increases in plant capacity disturbed comparisons for the North of Scotland, but the range was in any case smaller, the lowest monthly total being 60 million units in February and the highest 110 million in Oct.

Fuel and Load Factors

The industry as a whole used 31,794 thousand tons of coal in 1950, a 10% increase on the 1949 total of 28,908 thousand tons. Other fuels consumed were 73 thousand tons of oil (53·5 thousand in 1949) and 884 thousand tons of coke and coke breeze.

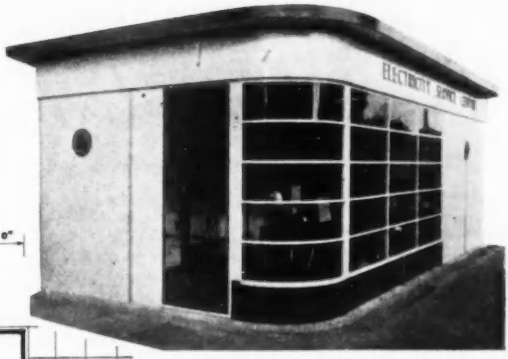
Nearly all the coal (99·6%) was used by the B.E.A. and the same Authority consumed 81% of the oil (59·1 tons). Since 50,117 million units were sent out from solid fuel fired stations during 1950, the solid fuel consumed for generation is approximately 1·46 lb/unit sent out, against 1·48 lb/unit sent out for 1949, calculated on the same basis.

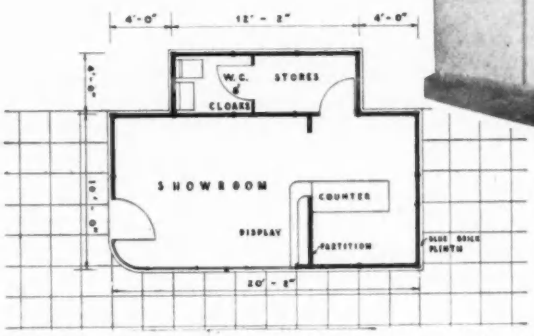
Based on an average installed capacity of 14,500 MW, the load factor on the generating sets in the country as a whole was 43·3%. For the B.E.A., with average capacity of 14,073 MW the figure is 44·2%, and for the North of Scotland, with an average of 425 MW, 35%. As an illustration of the variation occurring, it may be noted that the B.E.A. load factor for December was 53·5%, while for June it was 36·6%.

B.E.A. REPORT

In the article "The B.E.A. Report—An Editorial Commentary" which appeared in our issue of December 14, 1950, an error occurs in Fig. 2, on page 943. The figures for the ordinates refer to millions of units/employee, and not thousands as stated. The argument which the diagram illustrates is not affected by the error, since only comparative figures are there in question.

Midlands Enterprise





M.E.B. adopts prefab centres in go-ahead sales and service drive

WHILE the present national situation exists, the B.E.A. and its Area Boards have been compelled to practice stringent economies in their capital expenditure. The Midlands Electricity Board, in common with other nationalised and private concerns, has had to restrict its outlay and has found it impossible to erect the large and modern local showrooms planned. It is nevertheless anxious to give the maximum assistance to its customers by the provision of as many local Service Centres as possible, and the extension to all its consumers of the facilities which these offer. Accordingly, the Board has done the next best thing and proposes to erect small prefabricated showrooms on the sites of future permanent centres.

Despite their temporary nature, these new utility Service Centres are quite adequate and will suit requirements until times are better, and while they do not possess all the amenities of larger and permanent constructions, they do provide facilities for local contact between the Board's officials and the customer. One such centre has already been built and is now functioning. Local authorities have been most helpful in allowing its erection in front of the normal building line, which concession will enable work on the permanent building to be started when circumstances permit and in the meantime business will continue uninterrupted.

Construction

The "prefab" has been built with aluminium "H" section uprights, panelled with 1-in. cellular Holoplast, and covers in all an area of 20 by 14 ft. The foundations consist simply of a flat concrete raft which also forms the floor of the centre, but which is suitably covered with roofing felt and attractively finished by the addition of linoleum. Roofing felt, appropriately enough, has also been used in the flat roof, where two layers, with bitumen solution between them, cover wooden joists. Rectangular in shape, apart from a small annexe at the back, one corner of the centre has been rounded off and is open to the view of passers-by, thus allowing the showroom to become a shop window. Doors and windows along the side of the building, made of metal, are glazed, and the corner window has Perspex.

Display

The whole of the rectangle, that is, excluding the annexe which is used solely as a showroom and stores accommodation, forms the showroom. One corner has been partitioned off as a small office with a counter. The remainder is devoted to the display of appliances. All the business carried on at a normal centre can also be done in this miniature showroom.

The wiring for the electrical installation has been included in the roof and false skirting, the switch drop being threaded through the void in the Holoplast.

As this Centre is the result of efforts to economise in expenditure, the price is all important in assessing its real value. The sectional building, including the counter and some display fittings on prepared foundations, cost in the region of £500. This is not an exorbitant sum considering the facilities offered to local consumers.

Our readers' views . . .

Disclaimer from Scotland

MY attention has been called to the paragraph headed: "Lowland Tactics" in the ELECTRICAL TIMES of January 18, 1951. This paragraph misrepresents the attitude of my Board on certain fundamental points.

The Board has not claimed "specially favourable treatment" in respect of the disposal of pre-vesting local authority general reserve funds. Their last letter to the Minister, stated that "The South East Scotland Board, do not ask for any 'special concession.' They ask for the removal of a special burden which has been imposed upon them as contrasted with other area boards; and they ask that this should be done by applying a general principle, which will afford equitable treatment to all Boards."

As regards payments in lieu of rates, your paragraph invites comment on various points, including the point that a basis of allocation recently considered is not the size of area boards, but their profits. The essential point, however, lies behind your suggestion that "one of the purposes of the 1947 Act was to iron out local differences." This is true in regard to the area within the jurisdiction of any board. But it is not true in regard to differences between one board and another. The purpose of the Act, in decentralising the distribution of electricity to substantially autonomous boards, was to prevent centralisation above Area Board level and to ensure that area boards should conduct their business in the light of their own internal circumstances, whether relating to fuel costs, rating costs or otherwise. If this had not been the intention of Parliament, there would have been no need to set up any area board organisation.

Thomas J. Mullan
SECRETARY.

SOUTH EAST SCOTLAND BOARD

* * *

Electric Fires

IT is refreshing to note from your editorial of January 11, 1951, that the use of electric fires is having serious thought and that their true value, in no inconsiderable degree, as regards load factor may be appreciated. It is to be hoped that the B.E.A. and other persons in authority are fully cognisant of this aspect of the serious problem confronting them.

Space heaters in domestic use have received so much unfavourable comment that surely it is time that an effort was made to counter the grossly unfair and generally uninformed statements that are freely made concerning the much-maligned electric fire.

The letter in your issue of January 11, 1951, paints a black picture which does not seem warranted by facts. It should be noted that this letter refers to "space heating" as distinct from other domestic load, such as cookers, water heaters, etc.

I can, of course, only quote with certainty from personal use, but it is likely that the experience of my family represents a fair average over the country.

We, in common with many others, like to have one coal fire going during the winter months, with the consequence that electric heating is used for comparatively short periods as follows:

7.0 to 7.45 a.m.	Bedroom ...	2 kW
7.30 ,, 8.0 a.m.	Breakfast-room	2 kW
8.0 ,, 8.30 a.m.	Breakfast-room	1 kW
12.45 ,, 1.45 p.m.	Dining-room	2 kW
6.15 ,, 7.15 p.m.	Dining-room	2 kW
8.0 ,, 9.30 p.m.	Study ...	1½ kW
11.0 ,, 11.30 p.m.	Bedroom ...	2 kW

Let us be fair, for to state or infer that the electric fire is the prime cause of power cuts is grossly unfair. The above figures are factual and show that the only period during the day when the fire load coincides with the main factory load is when the fire has been switched down to half load from 8 a.m. to 8.30 a.m. And in terms of kilowatt-hours, out of a daily consumption of 10¼ units, only ½ unit clashes with peak-load periods.

It seems essential from the point of view of both users and manufacturers of the electric fire, that responsible members of the Government are advised of the true state of affairs before condemnation has gone too far and panic measures have prevailed.

H. T. Taylor

BIRMINGHAM 14

Reverse Protection

FOR SINGLE THREE-PHASE CONVERSION

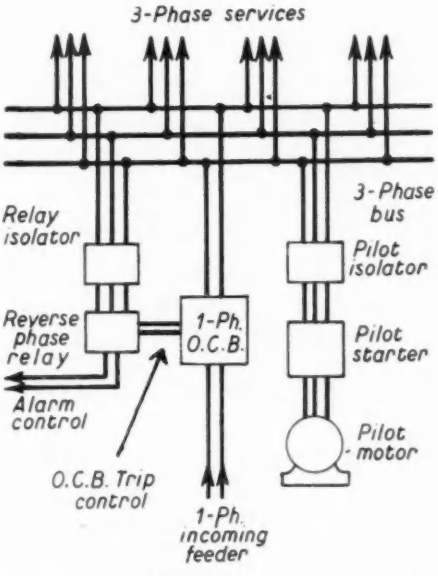
Relay provides inexpensive safeguard on Ferraris-Arno system

by C. R. E. LEGG and A. J. WHITE

IN factories taking a single-phase supply of electricity the Ferraris-Arno system of 1:3 phase conversion is often applied to secure a 3-phase voltage for electric motors.

In the Ferraris-Arno system, a pilot motor is provided at each main distribution board, and is started up before any 3-phase load is connected. A 3-phase voltage is thus imposed on the busbars, and further motors can be started up as required. The more motors that are in service on the circuit, the more they tend to assist the pilot motor in feeding third line power.

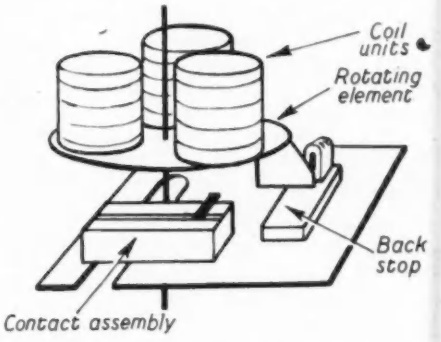
It is apparent from the above description that the direction of rotation of the pilot motor determines the direction of all machines switched in subsequently. If the pilot motor on such a system is not running or is tripped out due to a fault, there arises the possibility that another motor on the system may be switched on, and, after hunting, run up to speed in either direction. This motor may now act as a pilot to any other machines that are switched on, and if it is running backwards they will run up in a reverse direction. Where guillotines, croppers, press brakes and similar machines are involved, the result may be serious damage and a consequent loss of production time.



Block diagram of Ferraris-Arno supply connections in the system described

Precautions

An obvious precaution against this backward running is the fitting of reverse current relays to each pilot-fed group, but such a scheme entails a considerable outlay if more than one group is installed in a factory. Centrifugal switching could be fitted to individual motors, but this would mean that each motor on the system would have to be fitted, and apart from expense, a considerable amount of maintenance would be involved.



General arrangement of relay contacts

At a factory recently described in the ELECTRICAL TIMES (December 7, 1950), a relatively simple solution to the problem has been investigated, and has proved satisfactory. In this installation, each group of machines is fed from a central distribution panel with its own pilot motor and main single-phase oil circuit-breaker.

A relay is used which is essentially a phase-rotation meter connected across the 3-phase outgoing busbars. When the phase-rotation

on the busbars is correct, the moving element is held back against an adjustable stop. Should the phase-rotation be reversed, the moving element rotates away from its stop, until it operates a suitable contact assembly.

Any convenient arrangement of contact assembly may be used. On the relay tested, both opening and closing contacts were incorporated, the first opening the no-volt circuit of the single-phase o.c.b., thus tripping out the whole group. The closing contacts switched on a warning device.

An adjustable stop was provided so that the rotating element could be restrained in such a position in the correct direction of travel that a suitable time between phase reversal and c.b. tripping could be arranged.

The maximum time between reversal and operation of the original relay was two seconds. This proved to be quite satisfactory on a system with a number of 6 h.p. and 4 h.p. motors connected, together with several ¼ h.p. and ½ h.p. drilling machine motors.

A ¼ h.p. motor deliberately reversed with the pilot off tripped the main breaker in two seconds.

The authors wish to acknowledge assistance and facilities for experiments and testing granted them by Foster Transformers and Switchgear Ltd.

INDUSTRIAL DEVELOPMENT

Social Aspects of Technological Progress

IN his Truman Wood lecture, delivered before the Royal Society of Arts last Wednesday, Lord McGowan, honorary president of I.C.I., Ltd., chose as his theme the changes in the social life of the country during the past century.

He emphasised the changed status of the worker, particularly as far as amenities were concerned, over the period under review, and also pointed out that the centralisation of population caused by the exploitation of the raw material areas in the country had in the immediate past led to depressed areas. This had now largely been overcome by dispersal of industry.

The foundation of Great Britain's prosperity lay originally in textiles, iron, coal and steel. These foundations began to crumble in 1870 and had all but gone by 1914. Today the crown was worn by the U.S.A. There was no evidence that the workmen here were less capable than America's given equal conditions of work, and although the U.S.A. had a larger home market, this was not necessarily a definite advantage; it imposed on us, however, the necessity to discover all the natural wealth of this country; there was a long way to go before we had tapped all the hydro-power in Scotland, e.g.

The great difficulty was that we were not raising enough coal, and it might be many years before atomic energy would help us out.

The Future

One fundamental weakness was that although we were rich in invention, we frequently failed in the follow-up; that is in visualising the potential fruits of research and giving them practical application in industry. One of the reasons for this was the shortage of applied scientists. Whereas American universities produced more technologists than pure scientists, in this country in 1949, degrees in applied science represented only some 12% of the total in all faculties.

To increase the number of applied science graduates would involve changes not only in universities but in the schools. Boys would have to be steered towards a desire to acquire knowledge for practical ends. Further, the increase in technological skill was required in all levels. Technical colleges would have to be upgraded to share the burden with the universities and industry would have to learn to absorb the increased output and employ them to the best purpose.

Once industry absorbed these new men as fast as the supply allowed, more people would be attracted to follow the same path, and when this stage was reached we should be in a far better position to begin redressing the unbalance between American productivity and our own. Only in this way could we hope to keep ahead of the younger industrial nations and have new products to offer in place of those which tended to decline in international trade as the young countries began to produce within their own borders.

Running through all the reports of the productivity teams returning from the U.S.A. was the same fundamental theme, of which the essence was an entirely different psychological attitude to production from our own. This embraced a fervent belief—almost a religion—that the discovery of faster, cheaper ways of doing a job, and making better products for the service of man, was everybody's business.

Progress in Production

Export target-figure beaten by G.E.C.
Hydro-plant production on the increase

No. 4. General Electric Co. and Bruce Peebles & Co.

General Electric Co.

For the second year in succession the General Electric Company has exceeded the target set by the Government and overseas shipments have constituted a record both in value and volume. All classes of electrical equipment from heavy turbo-alternators to domestic appliances have gone abroad to achieve this.

Turbo-Alternators & Compressors

Orders received from the B.E.A. for 75 MW hydrogen-cooled machines now bring the number of such sets in hand up to a total of nine, and in the smaller class are the second 37,500 kVA set for Huddersfield and two of the same rating for Huncoat Power Station, Accrington.

Mixed-pressure sets driving salient pole alternators have been commissioned in the West Midlands Division of the B.E.A.

Overseas, turbo-generator sets have been delivered to Mount Isa Mines, Queensland; Samreaboi Timber Mill, West Africa; West Bokaro Mines, India; and the Electric Co. of Athens.

Iron and steel production has stimulated the demand for turbo-blowers, and units are on order for Dorman Long and Co. Ltd., and the Steel Co. of Wales. Numerous turbo-compressors and blowers are in hand for South African Mines and for the South African Iron and Steel Corporation.

Additional orders for hydro-electric plant for Pangani Falls in Tanganyika, will bring the capacity of the station up to 25,000 kW.

Engine-driven generators supplied to, or on order for, the Bremang Gold Dredging Co., Gold Coast Colony, exceed 8,000 kW.

Switchgear

The demand for 33, 66 and 132 kV switchgear remains high. At home 33 kV metalclad switchgear of 750 MVA and 1,500 MVA capacity has been supplied to a number of B.E.A. power stations. Abroad, similar equipment has also been shipped to the New South Wales Government Railways and to Port Elizabeth, Cape Province.

A new outdoor breaker of 250 MVA at 132 kV has been designed, the components of which can be used in existing breakers to uprate them to the 250 MVA breaking capacity. Total breaking time, from receipt of trip impulse to fault clearance is less than 0·07 sec. at all breaking currents.

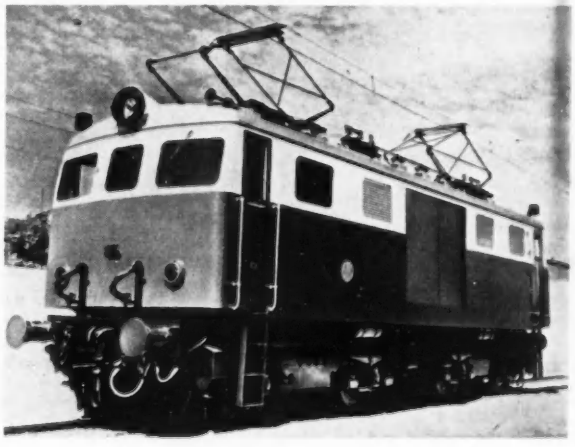
Numerous orders for 66 and 33 kV circuit breakers have been received from Australia and India.

Transformers and Rectifiers

Seven 45 MVA, 132/33 kV transformers are in hand for the B.E.A.; four units of this capacity have been delivered and, in addition, two 41,000 kVA units have been shipped to Huncoat Power Station. The first of six 70,000 kVA generator transformers for Uskmouth Power Station is nearing completion.

Two new types of on-load tapping switch have been built. Type N for use with 33 kV transformers of 10-20 MVA capacity, is rated at 400 amps and provides 15 steps and the type B,

1,500 V G.E.C.-Vulcan loco for Estoril, Portugal



rated at 25 amps and with 11 ratios, is for 11 kV transformers up to 750 kVA.

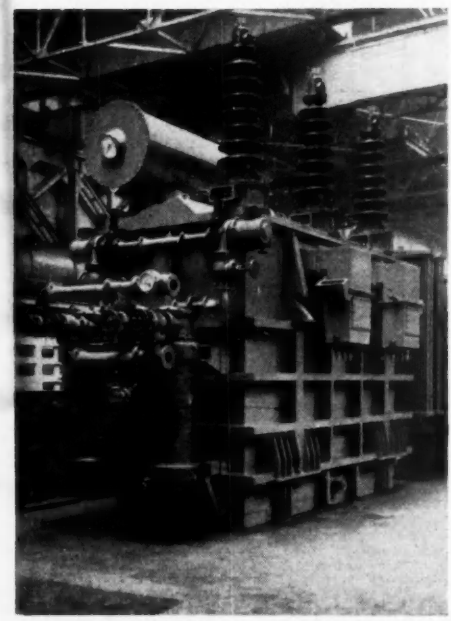
Many large mercury arc rectifier installations have been completed and others ordered during the year. A 1,500 kW twin-cylinder equipment for New South Wales employs control grids for arc suppression, the control itself being applied by electronic means.

The first British pumpless air-cooled steel-tank rectifiers in Belgium—three 630 kW units—are now in commission on the Chemins de Fer Vicinaux, and a 1,760 kW triple-cylinder unit went into service in the City of Edmonton, Canada.

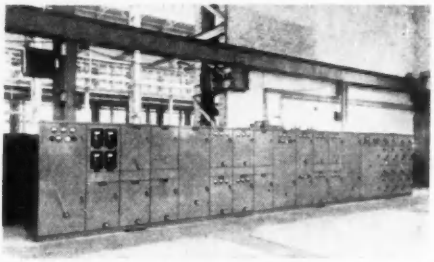
At home, four 625 kW, 500 V rectifiers have been supplied to a chemical works for electrolytic processes, and six further units are on order. Three 1,500 kW 600 V units have been supplied to Glasgow Corporation and six 1,600 kW 440 V units to the Steel Company of Wales.

Industrial Equipment

The range and quantity of industrial equipment ordered and produced is so great that only brief mention of some of the more important items can be made. Winding equipment for mines at home and abroad includes two geared a.c. skip winders for Manvers Main, the



Bruce Peebles 20,000 kVA 13,200/11,000 3-ph. water-cooled transformer nearly complete. It is one of two for the Loch Fannich H.E. scheme



G.E.C. 440 V airbreak switchboard in a sub-station near Birmingham

driving motors being 1,500 and 2,250 h.p., respectively; nine reversible slipring haulage motors aggregating 4,200 h.p. for service in the Swansea area and four 4,200 h.p. a.c. winders for the State Development and Investment Corporation of South Africa.

Rolling mill equipment has been supplied to the Abbey works of the Steel Company of Wales, to Austral Bronze Co. (Sydney) and to Kynoch works of I.C.I.

In the rail electrification field, the motor coaches and locomotive for the Estoril Railway, Portugal, have been delivered, and the electrical equipment for the 3,030 h.p. 3,000 V d.c. locomotives for South African Railways is in course of manufacture. The traction motors for this contract are rated at 505 h.p., and are the largest ever built for 3 ft 6 in. gauge.

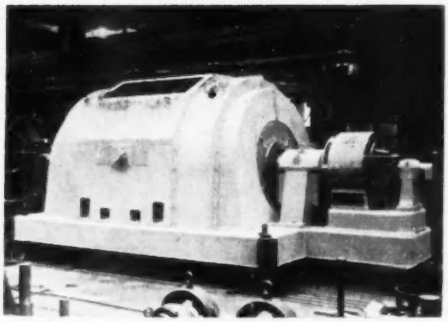
A new plug-in type railway signalling relay has been developed to ensure rapid and correct replacement of relays without the difficulty of unsoldering and replacing numerous wires.

Marine Work

Several vessels have been fitted with G.E.C. auxiliary electrical plant or main propulsion equipment. Full propulsion and auxiliary gear was supplied to the *San Salvador* single-screw turbo-electric tanker, the *Sir Thomas Brocklebank*, pilot boat of the Mersey Docks and Harbour Board, and auxiliary generating plant is in hand for a new passenger-cargo ship for the Booth Steamship Co.

Electronics and Lighting

Electronic control equipment for motor drives has been supplied to several firms, and extensive developments have been made in the telecommunications and radio fields. Research on hydrogen thyratrons for radar modulators has resulted in the production of two types of high-power valves having a long life. The CV 456 normally operates at 15 kV and has a peak output of 1·5 MW at 500 p.p.s.; the



15 MVA, 11 kV, 1,000 r.p.m. synchronous condenser for New Zealand (Bruce Peebles)

CV 2158 is slightly larger and has an output of 3 MW at 1,000 p.p.s.

Among large lighting contracts undertaken was that for the new House of Commons, and the main lighting for the Royal Festival Hall on the South Bank. Compact source lamps fitted with Xenon instead of mercury-cadmium have been developed.

Bruce Peebles and Co., Ltd.

Hydro-electric schemes at home and abroad have played an important part in Bruce Peebles' activities. The first 13,333 kVA vertical generator with a 20,000 kVA 132 kV transformer went into service at Grudie Bridge power station on the Fannich Scheme, Ross-shire. Seven 1,250 kVA diesel-engine generators, also for the Board were completed, and several complete hydro-electric plants are in hand in units up to 24,700 kVA, also for the Highlands.

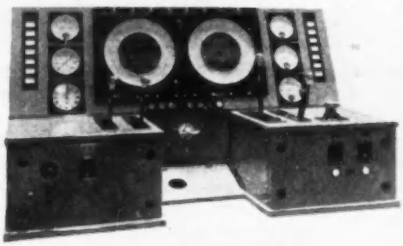
Shipments overseas of hydro-electric plant and generators include machines of 5,312 kVA and 2,600 kVA for Norway; two 11,111 kVA generators, a 15,000 kVA and a 10,000 kVA synchronous condenser for New Zealand, two 1,875 kVA generators for Canada; two 957 kVA units for South Africa and several further orders for Norway.

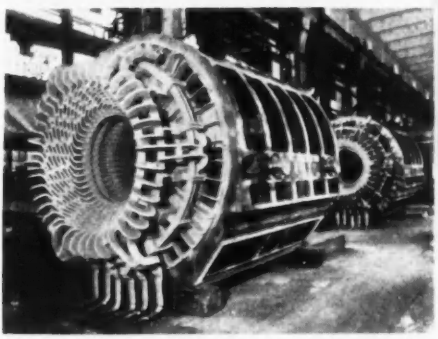
The company's standard ranges of motors continue in good demand, a significant increase being noted in orders for synchronous induction motors in sizes up to 2,250 b.h.p. and for large squirrel cage motors in sizes up to 2,050 b.h.p. (many for operation at 6·6 kV). The latter are often arranged for starting at full voltage without the use of compensator or other current limiting devices.

Converting Plant

Among the more interesting contracts in hand for converting plant are 19 2,500 kW, 1,500 V d.c. mercury arc rectifier equipments for railway electrification; two 1,000 kW glass bulb rectifiers for Edinburgh Transport Dept., 2,500 kW and 1,500 kW motor convertors and a 1,500 kW motor-generator set for India. An unusual order is for a 1,500 kW induction-type frequency booster to convert from 50 c/s, 3,300 volts to 60 c/s, 4,160 V. The set will consist of a squirrel cage induction motor, direct coupled to a frequency booster provided with a slipring rotor specially insulated to operate on the 3,300 V 50 c/s supply. About 345 b.h.p. will be delivered as mechanical energy from the motor shaft and 1,250 kW as electrical energy to the booster rotor.

Considerable deliveries have been made of all sizes of transformers from a few kVA up to the largest sizes. Examples of the larger machines are two 75 MVA and four 30 MVA transformers for the B.E.A.; one 30 MVA, eight 20 MVA, two 15 MVA, and a three-phase oil-immersed reactor capable of dealing with a power fault of 400 MVA at 11 kV for the North of Scotland Hydro-Electric Board, and three 8 MVA, 12 1,250 kVA and 24 250 kVA transformers for a Scottish oil refinery. Important consignments of transformers were made to hard-currency countries.





(Top) G.E.C. control desk for dynamically braked winding equipment for South Africa

(Below) Stators for 37,500 kVA G.E.C. alternators for Huncoat power station

Notes on Wiring
by **MEGOHM**

Technical Publications

The difficulty of keeping up to date

I WAS recently asked to advise on the choice of a suitable textbook dealing with all matters appertaining to wiring from both the technical and theoretical viewpoint, and had to confess that I am unaware of any such publication which is right up to date. The book was required by a student who is temporarily living in a remote part of the country, and is thus unable to continue his studies at one of the Polytechnics for the present season.

Admittedly, there are many excellent books available from which one can make a choice to suit one's pocket, but they do not usually contain the very latest information, which is what we require.

Collating Information

For the benefit of the uninitiated it should be explained that the writing of a text book is not such a simple matter as might be expected. From the time that the original manuscript has been delivered to the publishers to the time when the first proofs are received may be a year or so, and a similar interval of time may well pass before the final proofs are corrected and the volume duly appears in all its glory.

By that time, unfortunately, various new standards have seen the light of day, and in some cases a major revision of the I.E.E. Regulations may be issued without warning just before the date of publication. This is a major tragedy to the conscientious and well-intentioned author who has burnt the midnight oil—usually for a totally inadequate remuneration—to ensure that all his facts and conclusions are beyond dispute.

Those of us who are based on the larger towns or cities are fortunate in having access to the various associations, meetings, libraries, etc., for any information we may wish to obtain, but the man who is working on, say, a two-year contract, living away in lodgings beyond the beyond, has none of these facilities to improve his knowledge. To him the weekly technical press is the only link with fellow students, and he finds it difficult to segregate and retain all those particular items in which he is interested in some sort of readily-accessible manner.

Constant Revisions

What, then, is the solution to the problem of avoiding textbooks which are out of date before they are published? I would suggest that we have reached a stage where revisions at such close intervals are really not necessary. Obviously, we cannot stifle progress, and new developments take place from time to time as for example with fluorescent lighting, or aluminium sheathing of cables. But with the ordinary run of work no sudden major changes occur overnight as it were, and it is, therefore, difficult to follow some of the amendments to the regulations which seem to be of greater academic than practical import.

As an illustration of this, we had, in the eleventh edition of the I.E.E. regulations, an elaborate table giving the number of cables which might be accommodated in the various sizes of conduit up to 2½ in. in size. Two values were set out, one referring to runs not exceeding 14 ft between draw-in boxes, and with the conduit not deflecting more than 15° from the straight; the other applying to runs deviating more than 15° from the straight. The present twelfth edition gives the latter corresponding figures only and, incidentally, omits 2½ in. conduit, although this is still a standard size, albeit not much used.

Keeping *au fait* with British Standards is also not too easy for those in the backwoods. After ascertaining the number—given in the Regulations without the year of publication—the up-to-date version is found by consulting the 1949 B.S.I. Yearbook, 1950 addendum to this, and all subsequent monthly information sheets. By this process one can deduce if a treasured copy is the current version, complete with all amendments.

It is only fair to add that the B.S.I. spare no trouble to publish the latest information, or assist those seeking help, in every way. The trouble is that with so many small details to keep in mind it is very difficult to ensure that nothing important is overlooked.

Perhaps, then, we could have a close-season for revisions, to give the poor authors a chance.

ELECTRICAL INTERLOCKS

Their application to the guarding of dangerous machinery

ELECTRICAL machine controls lend themselves readily to interlocking for protective purposes, but this very facility introduces some danger that the safety precautions may be more apparent under normal conditions than real and effective in an emergency. A critical study of the problem was presented to the I.E.E. Utilisation Section on Thursday last by Mr. W. FORDHAM COOPER, B.SC. (ENG.), M.I.E.E., A.M.I.Mech.E. (Electrical Branch, Factory Department, Ministry of Labour and National Service), in a paper entitled "Electrical Control of Dangerous Machinery and Processes: Part 2—Electrically Interlocked Guards on Machines." Part 1, whose existence is inferred in the title, was read before the Institution in 1946. (Electrical Times, Nov. 21, 1946, p. 697.) Part 3, "Remote Supervisory Control," is promised for early next session.

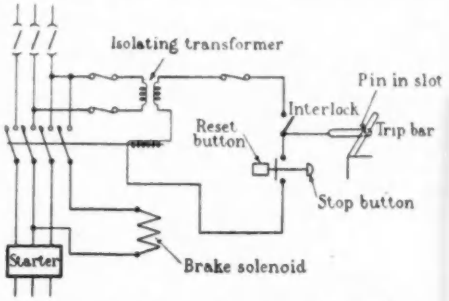
In the early part of his paper, the author classifies the risks against which protection should be provided, and lists five types of guard—fixed, automatic, interlocked, trip and positional, and distance. In the rest of the paper he deals mainly with the interlocked (guards such that they must be in correct adjustment before any potentially dangerous operation can commence) and the trip (guards which stop the machine or automatically cause other appropriate action to be taken immediately danger arises).

General Principles

Interlocked guards, which must be locked in position so long as danger persists, split into two types, those in which the machine must be still before the guard can be opened and others in which the opening of the guards stops the machine. In both cases it should be impossible to restart the machine until the guard is again in position and locked, and it is usually advisable to bring braking devices into operation as well as cut off the power supply. For trip guards, which operate only when danger is imminent, brakes and/or clutches are almost invariably required, though even with these it may be impossible to stop a heavy machine in time to prevent an accident.

For some purposes, such as setting up and cleaning, it may be necessary to allow the machine to run unguarded. Barring gear can occasionally be used, but often the only solution is to run the machine very slowly under careful control. With electrical interlocking, it should be possible to prevent normal running but permit the use of a special inching or crawling controller.

In all cases, gear should "fail to safety." Brakes should be spring loaded and held off by applying a voltage, and clutches held in similarly. Such precautions guard against dirty contacts. Interlocks should not be included in the low-volt release circuit of motors or starters, as in most cases this makes it possible to restart the machine with the guard open and the starter handle held in. The wiring and power supply circuits should all be carefully considered to see what "sneak" circuits can nullify the guarding effect due, for instance, to accidental earths.



Use of an isolating transformer and low voltage interlock circuit on dangerous machinery
The "stop" and "reset" buttons are mechanically interlocked to prevent either of them sticking

Braking must be employed when a machine has to be stopped very quickly. An ordinary friction brake is the best device, especially if the parts to be arrested are reduced to a minimum by the incorporation of a clutch. Electrodynamic brakes are a useful addition to friction types. Care must be taken with the connections in all cases, since the back e.m.f. developed by shunt motors or the generating action of induction motors with associated capacitors may prevent operation of a brake or clutch while the motor slows down. For this reason it is advisable to control brakes and clutches by independent contacts on the main contactor.

As has already been stated, self-resetting safety devices are objectionable, whether they are trip-guards, limit switches or emergency stop-buttons. If such devices operate, there

is something wrong which should be investigated. To this end, it is sound policy to arrange matters so that the safety devices cannot be reset by the operator, but require the attention of an electrician or fitter.

Some large machines are almost surrounded by guards, which have to be removed from time to time for cleaning, adjustment, etc. Once removed, they are likely to remain off unless precautions are taken against this. A possible arrangement is to have each guard spanned by a firmly fixed insulated conductor, with a plug at one end and a socket at the other. These are arranged so that the interlock circuit is only complete when all the guards are in position and connected up, one to another.

Photo-electric cells have often been suggested, and sometimes used, to provide a trip guard formed of interlacing reflected beams, but they have several disadvantages. These include ease of defeat with an electric torch, and rather great sensitivity to changes in background illumination (which may make them ineffective in bright sunlight). There is the added objection, as compared with other forms of guard, that no physical obstruction and delay is introduced which will slow a quickly moving hand before it reaches a dangerous position.

DISCUSSION

MR. G. P. BARNETT (H.M. Chief Inspector of Factories) considered interlocks from the point of view of factory managements. At present there are about 32,000 notifiable accidents in industry every year, a great many of them being attributable to machines not securely fenced. It was very often more a case of failure to properly maintain guards than of failure to fit them. There is much to be said for making guards as simple as possible, but some of the more elementary types were easy to remove, and often were not replaced before the machine was started up again.

Mechanical interlocking generally involves some connection, by levers or otherwise, between the guards and the controls of the dangerous machinery. Such methods have a certain lack of flexibility, especially where the controls are remote from the machine to be guarded, and here electrical circuits have advantages.

He expressed the hope that much more may be done by the manufacturers of machinery to consider the fitting of guards and interlocks at the design stage.

MR. R. H. COBBOLD (W. D. and H. O. WILLS) discussed the question, "When to interlock and when not." He spoke as an engineer concerned with a range of automatic machines, many of which have several guards. To fit these with interocks, while it may increase the safety, is extremely expensive. There is the subsidiary point that with several interlocks fault tracing becomes extremely difficult. Guards get rough treatment in factories, and eventually trouble is likely to be caused. Interlocks must be reasonably tamper-proof but, sooner or later, the maintenance men must be able to get at them. He thought that machine manufacturers should not themselves fit electrical interlocks : their general standard of electrical work was too low.

MR. H. A. HEPBURN (Factory Dept.) thought that it might be argued that mechanical interlocks were more reliable than electric. It has to be remembered, however, that mechanically interlocked guards are subjected to a considerable amount of wear and tear. Much of the trouble that this caused can be overcome by the use of the more flexible electrical methods of interlocking. Electrical interlocks are specially useful when the controls are some distance from the machine to be guarded. The general standard of electrical work on machines he considered as satisfactory from the safety angle.

Photo-electric cells as a guard are successful only if the time for the machine to come to a standstill is less than the time for the operative's hand to break the beam and reach the dangerous position. This latter time is often surprisingly short, and experiments using high-speed cinematography are in progress to determine it.

MR. R. F. MOORE (Osram) gave an example of the hazards of using 250 V interlock circuits. Speaking on torque reversal, he suggested that this method of stopping the machine offers many advantages over the friction brake. Finally, he drew attention to the relatively dangerous nature of much of the food-preparing machinery used in canteens.

MR. R. ATKINS considered that an advantage of mechanical interlocks is that the operator can see if they are going wrong: this is usually impossible with electrical systems. He suggested that the Factory Department might set up a scheme whereby inspectors could visit factories and examine plant in an advisory, as distinct from "police" capacity. If such a service were arranged, industry could probably afford to pay for it.

MR. S. A. STRODE considered that accidents usually happened when the "skilled" man, the tool-setter, for example, came along to examine a faulty machine, and removed the guard. From this consideration, the Castell lock system was an excellent method of interlocking.

THE AUTHOR, replying shortly to the discussion, suggested that it is quite wrong to interlock a machine so that the maintenance men cannot do their job. Matters should not be left so that the maintenance man has to use his ingenuity: an obvious method of defeating the interlocks should be provided. He agreed that the standard of electrical equipment in machinery is often, unfortunately, low, but thought that matters were improving. Torque reversal he considered as an excellent method of braking, but one that tends to increase the strain on the whole of the transmission.

Problems and Practice

IN ENGINEERING

Hot Wires

A CONSUMER rang up one very wet evening asking whether there was load shedding as his electric fire was very dim and his light bad. I assured him that there was not and promised to send a man along to have a look at his installation the next day.

Shortly afterwards, however, the same very agitated consumer rang up to say that on preparing to go to bed he had opened his airing cupboard and found that a wire from the circulator in his hot-water tank was glowing. I instructed him to open the main switch and to let me know what happened. He did this and reported no difference, so I said that I would go along to see it. On arriving I had a look at the circulator and found that the earth wire was distinctly glowing. As the installation in the house was now dead I had a look at the service feeding the house, and found that the phase conductor was welded to a stench pipe. This pipe was only an inch or so from the waste pipe from the bathroom, and on such a wet night a very good leakage path existed between the stench pipe and the waste pipe. The wire was removed from the pipe with some difficulty and temporarily taped up to clear the trouble. —*J. P.*

Controlled Reflector Fires

THERE are a large number of electric heating systems on the market which are equipped with thermostatic control, particularly convectors and oil-filled radiators, but so far nobody seems to market a radiant reflector-type electric fire with thermostatic control.

In my own house we have had an "Adaptastat" connected to our "Flamera" fire in the living-room since January 1, 1949, and the results have been so good (*see* "Economy in Cash and Coal," Electrical Times, March 30, 1950) that I have now arranged the thermostat so that it is plugged direct into a two-pin socket fixed to the fire instead of being connected to an adaptor at the wall plug. I have re-arranged the connections so that the artificial coal is now illuminated all the time that the fire is connected, and the thermostat controls the heating elements only. It is still, of course, possible to switch off either element when not required by means of its normal control switch on the fire. I also have a "shorting-out" plug which can be plugged-in in place of the thermostat should we require to use the fire under switch control only without thermostat.

On first sight it does not seem possible that satisfactory results can be achieved with a thermostatically controlled reflector fire, but

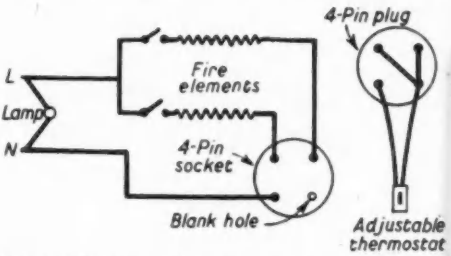


Fig. 1 (left) shows element connections, and Fig. 2 (right) the wiring of plug and thermostat

I am sure now, from actual experience, that it is possible provided that the following points are observed:

(*a*) The thermostat must be positioned so that it is not directly affected by the radiant heat rays emanating from the reflector of the fire;

(*b*) It must be positioned so that it is not in the stream of warm air rising directly above the fire;

(*c*) It must not be positioned immediately adjacent to a window or door.

The object of the above is to ensure that the thermostat operates on average room temperature and is not affected by local hot or cold spots. In our own case the thermostat is positioned on a wall approximately 4 ft 9 in. from the floor, near the fire, but behind and above and slightly to one side of it.

I see no reason why the makers of artificial coal electric fires should not fit thermostat sockets as a standard feature, together with a shorting-out plug or switch for use when the thermostat is not required.

If the neutral side of the two heating elements were brought to separate connections instead of to a common bar, it would be possible to use a four-pin plug and socket for the thermostat connection and to get four different

arrangements without any separate shorting-out plug or switch. This would be particularly useful where the two heating elements are of different loadings.

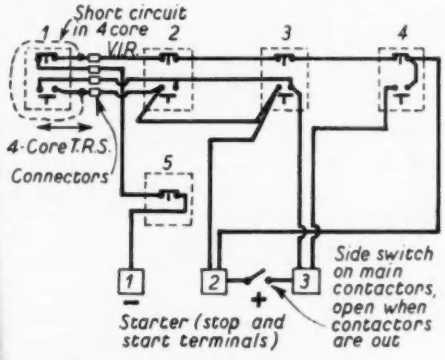
The four-pin socket on the fire would have the sockets arranged in square formation, and one of the sockets would be a blank hole without any electrical connection (Fig. 1).

The four-pin plug would have the thermostat connected to two pins, and three of the pins would be connected together (Fig. 2). Four positions would be possible, as follows:

(*a*) Both elements on thermostat; (*b*) Both elements on direct switching; (*c*) Top element on thermostat; bottom element on direct switching; (*d*) Bottom element on thermostat; top element on direct switching.—*P. G. C. Wilding.*

Stop Button Danger

ON being called to a bag elevator on an inclined plane, it was found that on pressing either Nos. 2, 3 or 4 stop buttons the elevator would not stop. But on pressing No. 1, which was mounted on a movable chute, and No. 5, the elevator did stop. After testing, it was found that the four-core rubber



Conveyor control wiring connections

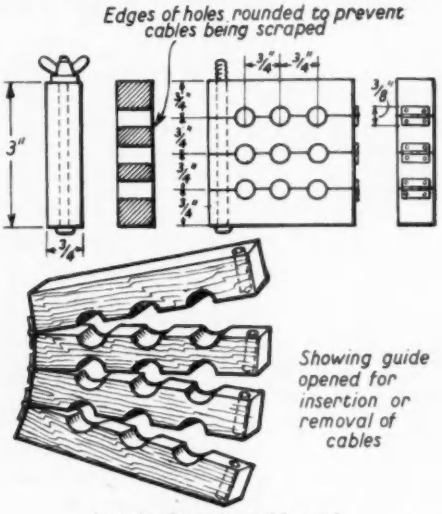
sheathing had burst, and two wires short-circuited. After a new piece of four-core had been put in the job was perfectly all right.—*G. Bratt.*

Cable Guide

THE accompanying diagram is of a simple piece of apparatus which was constructed of hardwood by the writer many years ago, and has proved invaluable when drawing cables into conduits.

In use the guide is held in one hand and cables fed into the conduit with the other. Upon reaching the last few inches of cable to be drawn in, the bolt is removed and guide can then be easily removed.

There is obviously no limit to the amount of cables (or design) that can be arranged for this type of guide, but the writer has found that the nine holes arranged in square formation have proved to be the most serviceable for general purposes.—*L. W. Gambrill.*



Details of wooden cable guide

Slipring Slip-up

DURING the course of some d.c. to a.c. changeover work taking place where I am employed, an unusual incident came to light.

One particular d.c. shunt motor had been selected for replacement. A slipring motor just returned after a partial rewind had been earmarked for the job. Other preliminaries completed, the actual changeover was accomplished without event until the trial run. The starter was a two resistance step p.b. pattern.

On starting, the motor sprang to life like a d.o.l. squirrel cage motor, and the belt skeetered from the pulley. Suspicions fell on starter, but proved fruitless. Examination of rotor connections at sliprings revealed a piece of short-circuiting wire used ostensibly when motor was tested after repair, and its removal forgotten. The protecting casing over sliprings had prevented it being observed when connecting up.—*W. B.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Controlled Speed Drives

Principles of Operation of the "Velotrol"

MANY industrial drives need to be accurately controllable in speed, and for this purpose the d.c. motor still holds a prominent place. With the general a.c. supply, rectifiers are then essential, and it is but a short step to utilising the rectifier in the dual role of a.c. to d.c. conversion and also controller.

For most industrial purposes the speed of d.c. motors can be controlled in two ways. (1) By variation of armature volts (for drives requiring constant torque characteristics), and (2) by variation of shunt field strength (for drives requiring constant h.p. characteristics).

Both these functions are catered for in the "Velotrol" drive made by Hackbridge and Hewittic Electric Co.

System Details

Although the exact system to be adopted is naturally a function of the customer's requirements, in general the principal equipment consists of a grid controlled mercury arc rectifier, using either a phase shifter to control the point of firing or if extreme sensitivity is required, a sharp fronted wave control on the grids to establish a precise firing instant. If long running at slow or intermediate speeds is required, it is recommended that the voltage input to the rectifier transformer be regulated either by introducing a voltage regulator to vary the a.c. input voltage, or by using tapping switches on the transformer itself. Both these methods allow the rectifier to be run with a minimum of grid control at the lower voltages and thus maintain a high power factor.

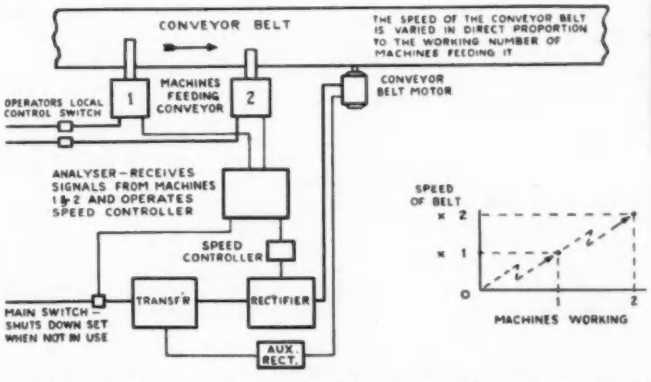
For shunt field regulation, the method adopted is to use SenTerCel dry rectifiers, the a.c. supply being provided either by an auxiliary transformer or by a winding on the main transformer. The variation in the rectified current can be controlled in three possible ways: (*a*) by using a rheostat, (*b*) by using either an induction or sliding contact regulator, or (*c*) by controlling the a.c. input to the rectifier by static electromagnetic devices such as transductors.

These two control methods can be combined together to afford the widest speed range whilst maintaining a high power factor over a substantial portion of the controlled range.

Typical apparatus where the constant torque characteristic is required are the driving of calenders, printing presses, textile ranges, chain grate stokers, wire drawing machines, etc., but applications where constant h.p. is needed are in the the driving of paper reelers, stitching machinery, lathes, grinders, jig borers, and so on.

Control Gear

Usually the control gear for "Velotrol" rectifiers is arranged to be in a separate compartment in the rectifier cubicle. This enables the system to be tested as a whole, cuts down the length of cable leads, and gives the utmost compactness with the minimum number of interconnections. As no mechanical movement is involved in the control gear, the response to operation is most rapid. Hand or push-button operation can be provided or by suitable modification the control can be fed in automatically. Typical facilities afforded by the system include manual or automatic control of speed over a wide range with starting and all normal safety interlock features; control of torque, holding shaft speed constant to within close limits; rapid braking; inching or crawling; and reversing.



A typical application of "Velotrol" drive with automatic control to a conveyor belt system

overseas news

Tax on Electricity

A proposal to tax electricity was put forward in the Norwegian Parliament last week-end. It is suggested that the tax should be one-tenth of one Ore per kWh (equivalent to about .0001 of a shilling), which would bring in 16 million kroner a year, to be devoted to subsidising hydro-electric development.

Sydney's Dilemma

It now seems that Sydney, New South Wales, will not get the "packaged self-contained steam generating plant" (to which we referred on December 28) as quickly as was at first expected. Hope had been raised by statements that the first unit would be shipped from America in February or early March, but the manufacturers have now made it clear that there is little possibility of shipping the first of the machines before September, and others may follow in October and November. So, instead of the plant being in use this winter, it will be 1952 before any easement of the power cut problem can be expected. There is naturally some recrimination in the local press. The State Electricity Commission has also announced the setting up of a special bureau from which details of expected power cuts may be obtained.

Increased Charges

A 25% increase in tariffs by the City Electric Light Co., Brisbane, has been approved by the State Electricity Commission of Queensland. This will mean that more than 60,000 people in 10,000 square miles of South-east Queensland will in future pay about 78% more than they did in January, 1948.

O.H. or Underground?

The unsettled question of whether overhead distribution work should be extended in Ottawa, is holding up the connection of many new homes in the area, Mr. S. W. Cannif, general manager of the Ottawa Hydro-Electric Commission, has reported. Recently, at the request of Board of Control, the Commission stopped installation of overhead wiring on Elliot Street. Previously, the Board had received numerous complaints from the local residents. The city representatives have been unanimous in favouring underground wiring but are concerned over the costs involved. Mr. Cannif has asked for an immediate decision by the Board of Control as to whether the wiring is to be placed underground or the present policy of overhead wiring is to be continued.

Development in Portugal

The Castel do Bode power station and dam on the Zezere river were formally inaugurated by the President of Portugal last Sunday. The equipment for the station is being supplied jointly by the English Electric Export and Trading Co. and the Metropolitan-Vickers Electrical Export Co. It houses three 73,000 h.p. turbines. It is expected that the Cavado hydro-electric project, Portugal, will also be operating in February, 1952. It is reported that the cost of generation by these hydro-electric stations has come rather as a shock to the Portuguese public, who had evidently been led to believe that they would enjoy unlimited and extremely cheap power.

A Switch in Poland

Work has been stopped on the construction of a new electrical power station near Oswiecim, south-western Poland, it is reported. The scheme, which was started about three years ago, is in an advanced stage, apparently. Instead, another electrical power plant is to be built in Warsaw. The new plant, according to Polish reports, is to be the largest power station in Europe outside the Soviet Union, and will be equipped entirely with Russian machinery.

Copper Production

With copper in such universal demand, Yugoslavia is pushing ahead with development of its deposits. The Bor mine—Europe's largest individual source—produced 40,000 tons of blister copper last year, and other areas are now being worked. Previously a large proportion of the country's copper output has been exported in the raw state, but a further large electricity plant is now being erected at Bor to process the whole output. Half the work on this plant is scheduled to be completed this year. A copper rolling mill is also in course of erection at Sevojno, to be completed next year. In addition, an up-to-date cable factory is being built at Svetozarevo. It was started three years ago, and when finished will turn out all types of cables. The only existing cable factory, at Novi Sad, is quite inadequate to meet the requirements of the Yugoslav electrification programme.

State Organisations in Greece

A decree for the establishment of a State-owned electricity enterprise was signed recently by the deputy Prime Minister and Minister of Co-ordination, Mr. G. Papandreou. The American company Ebasco are to act as technical advisers to the enterprise which will supervise the execution and administration of various Greek electrification projects throughout the country.

Another Scheme

It is understood that the Hydro-Electric Department of the Government of Madras is shortly to call for tenders for plant for the Tungabhadra water power project. This scheme envisages the construction of a power-house at the foot of the Tungabhadra Dam with two 7,500 kW units initially; the construction of a second power-house called the Canal Power House with two 7,500 kW units initially, and one more unit in the sixth year of operation; and the erection of a power transmission grid connecting the power-houses with the consuming centres in Bellary, Anantpur, Kurnool and Cuddapah districts. The first stage of the scheme is expected to be completed in about four years. The power-house will be designed to accommodate two more units at the Dam Power House and one more unit at the Canal Power House at a later stage. The development is estimated to cost Rs 73·3 million initially, rising to Rs 79·4 million in ten years.

Acquisition

Negotiations are in progress between the Madras Government and Madras Electric Tramways Company for the nationalisation of the city's tram system, and a figure of £375,000 has been mentioned as a likely purchase price.

Inauguration

A few days ago President Rajendra Prasad performed the formal opening ceremony of the 20,000 kW Khaperkeda thermal electricity station, the first to be constructed under the Madhya Pradesh Government's power development programme. Situated 12 miles from Nagpur, the new power station has an initial generating capacity of 20,000 kW which will be raised to 30,000 kW by September next. About 840 miles of transmission lines lead from it to feed 21 main substations at Nagpur, Amravati, Akola and other places, covering Berar, the Pench and Chanda coalfields and the manganese mining areas. All the substations will be in commission by June. Speaking at the function, Dr. Rajendra Prasad congratulated the Madhya Pradesh Government on building the station, which would supply power not only to the towns but also rural areas. He thought that given power supply, the people of the villages would be able to put their creative abilities to the maximum use in developing small-scale industries. It was expected that the country's present generating capacity would be increased many times when the various hydro-electric projects were completed.

India's Outlook

The under-development, electrically, of India, has been exemplified in two statements recently made in authorative quarters. Firstly, Prof. M. S. Thacker, when presiding over the engineering and metallurgical section of the Indian Science Congress, pointed out that as against a possible hydro-electric potential of 30 to 40 million kW, only about half a million had so far been developed. Of this power, more than half is used by urban consumers. Mr. N. N. Iengar, chairman of the Central Electricity Commission, India, has also stressed that of the 562,449 towns and villages in the country only 2,938—about ½%—had been electrified up to the end of 1949. In fact, roughly 3% of the country's population uses over 56% of the total public utility installed capacity!

Plant Awaited

Although the civil construction work of the new Vryburg power station, Bechuanaland, is nearing completion, the two 750 kW turbines which are on order from Britain, are not expected to be ready for shipment for a couple of months yet, it was stated at the meeting of the town council earlier this month. The South African Railways are unable to continue assistance to keep the existing plant going it was pointed out, and the suggestion was made that two 50 kW generators, available in the country at a cost of about £3,590, should be obtained to tide over the period. The town clerk pointed out that when the turbines from England had been installed, the 50 kW plants could be sold.

Concrete Pylons

Work has restarted on the £400,000 south coast power scheme of the Electricity Supply Commission of South Africa. Recently the contractors suspended operations while a reorganisation intended to speed up work took place, and this reorganisation is not yet complete. In the past 12 months some 40 miles of 5,000 lb. concrete pylons, for the new 88 kV lines, have been erected. The engineers and linesmen are now nearly at Umzinto, where the first major step-down station is being built. It is hoped that they will reach Marburg, near Port Shepstone, towards the end of the year. The lines are being built two miles inland to avoid the heavy, moist sea atmosphere, which has been largely responsible for interruptions and breakdowns in supply along the existing 33 kV system in recent years. The biggest problem facing the engineers on this job is the hilly, broken terrain. Mr. E. L. Damant, head of the Commission in Natal, has referred to it as some of the most difficult country in the world for transmission lines.

Action Needed

A preliminary report recently given to the Que Que Town Council, North Rhodesia, by a representative of its consulting electrical engineers, Messrs. Brian Colquhoun and Partners, states that if electricity consumption increases any further at its present rate, there will be major breakdowns in the system, which is in dire need of an overhaul. Much of its present equipment is obsolete.

Power Target

In the course of his annual economic review of Congress, President Truman set a number of targets in the U.S. rearmament effort. One of these is the increase in electricity generating capacity by well over 20 million kW during the next three years.

PERSONALITIES

IN THE INDUSTRY

District manager at Esher and Weybridge, South Eastern Electricity Board, **Mr. C. A. Keene** was the recipient last week, of a presentation, on the occasion of his retirement. He has been manager of the local electricity undertaking since 1931. The Esher area of S.E.E. Board is now combined with the Kingston and Surbiton districts under the managership of **Mr. D. C. Thomson,** B.SC.(ENG.), M.I.E.E.

Belling & Co. Ltd., have recently announced that Messrs. **A. B. Wishart, R. M. Hawkins, H. M. Hibberd, D. M. Brunton** and **H. P. Aston,** have been appointed directors of the company.

The Minister of Fuel and Power has reappointed **Alderman A. Sturgess,** O.B.E., J.P., as a part-time member of the East Midlands Electricity Board.

The Canadian Marconi Co. announces that **Mr. A. H. Ginman,** of Montreal, has relinquished the presidency of the Canadian Marconi Co., but will remain a member of the board, Mr. Ginman's successor is **Mr. S. M. Finlayson,** of Montreal.

A number of changes in the group factory organisation of Hoover, Ltd. are announced. At the Cambuslang factory, we note that **Mr. C. J. Hodges** is now works manager, with **Mr. J. H. Turner** as material control manager, and **Mr. E. E. Baldwin** as production manager, while **Mr. W. Warren** takes the title of chief engineer (Cambuslang). At the Merthyr Tydfil factories, **Mr. F. Scammell** becomes material control manager, **Mr. A. McDonald** (formerly of Perivale Engineering Department) becomes chief engineer (Merthyr Tydfil), and **Mr. J. S. Hemingway** (previously with Production Engineering Department, Perivale) becomes production control manager. At the Perivale factory, **Mr. J. Gilson** is now chief production research engineer. **Mr. J. C. Shapley** (previously at Cambuslang) is chief production engineer, and **Mr. S. E. Fox** becomes chief plant engineer. Finally, at the High Wycombe factory, **Mr. F. A. Austin,** previously superintendent, becomes works manager, and **Mr. J. Halifax** is production superintendent.

Mr. E. D. Johnson, O.B.E., has been appointed a director of the Indian Cable Co. Ltd., Calcutta. He has been works manager of the company's factory at Tatanagar, Bihar, for twenty-two years.

Mr. E. Harrison, who for the past 28 years has acted as agent in the Humber area for the Marconi International Marine Communication Co., Ltd., has now retired from active business, but he has agreed to act in a consultative capacity. Contract matters in the district will in future be dealt with by **Mr. J. R. Thomson** and **Mr. P. G. T. Sloggett,** the company's depot managers in Hull and Grimsby respectively.

The Council of the Institution of Mechanical Engineers have awarded the 1951 James Watt International Medal to **Dr. H. H. Blache** of Denmark, for his contributions to the advancement of mechanical engineering, and particularly for his pioneer work in the development of the large marine diesel engine.

Chairman of the Cable Makers' Association for 1951 is **Mr. E. C. Holroyde,** comp. I.E.E., vice-chairman of Crompton Parkinson Ltd. He succeeds **Mr. F. Anderson,** of W. T. Henley's Telegraph Works Co. Ltd. Of the C.M.A.'s affiliated associations, **Mr. H. B. Davies,** of Enfield Cables Ltd., is chairman of the Main's Cable Manufacturers' Association and the Main's Cable Manufacturers' Association (Super-Tension) for the current year. In addition, **Mr. C. H. Broughton Pipkin,** of British Insulated Callenders Cables Ltd., has been re-elected chairman of the Rubber and Thermo-plastic Cable Manufacturers' Association, likewise **Mr. F. W. M. Lewis,** of Siemens Brothers and Co. Ltd., as chairman of the Overseas Rubber Cable Manufacturers' Association.

Mr. E. C. Holroyde

Mr. H. B. Davies

Mr. C. H. B. Pipkin

Mr. F. W. M. Lewis

In succession to Mr. D. W. Coates, C.B.E., M.A., LL.B., F.C.A., who retires on April 10, the British Electricity Authority has appointed **Mr. A. M. Scott,** M.C., C.A., as chief accountant. Mr. Scott has been deputy chief accountant (distribution) since nationalisation of the industry. Earlier, he had been controller of Edmunson's Electricity Corporation Ltd., and its associated companies since 1936. He subsequently became also a director of those companies. Educated at George Watson's College, Edinburgh, he later became a member of the Society of Accountants in Edinburgh, and was for seven years a partner in the firm of Graham, Smart and Annan, chartered accountants, of Edinburgh and London. Mr. Coates, who retires in April, was previously chief accountant to the Central Electricity Board since its establishment in 1927. A Yorkshireman, he was educated at Wycliffe College and St. John's, Cambridge, and after some years in private practice, joined the Controlled Establishments Division of the Ministry of Munitions in 1916. A year later he became chief accountant of the Mines Dept. of the B.o.T., and subsequently financial secretary and financial adviser. He was a founder-member of D. W. Coates, West, Grimwood and Co., and, *inter alia*, a member of the Land Fertility Committee in 1939-41. During 1942-3, when coal control was instituted, he was seconded by the C.E.B. to be finance director of the Coal Division of the Ministry of Fuel and Power.

Assistant general manager of the Ottawa Hydro-Electric Commission since October, 1949, **Mr. G. R. Davis,** M.Amer.I.E.E., is to take over the post of general manager of the Commission on the retirement of **Mr. S. W. Cannif,** scheduled for some time next summer. Before joining the Commission in 1937, Mr. Davis served with the Hydro-Electric Power Commission of Ontario, first on distribution work and then on construction projects for the eastern area.

Mr. R. Buckley, publicity manager for Kolster-Brandes, Ltd., and Kent Mouldings, is now also appointed as publicity manager for Brimar Valves and of the Industrial Supplies Division of Standard Telephones and Cables, Ltd.

Mr. N. B. Croft

Elexcel Ltd. are now represented in Northern Ireland by **Mr. N. B. Croft,** Assoc.I.E.E., who is operating from 73 King Street, Belfast. (Phone: Belfast 23547.) Earlier he had been Belfast branch sales manager for B.I. Callender's Cables Ltd.

Previously with Crompton Parkinson Ltd., as textile application specialist, **Mr. D. G. Maynard,** has joined Laurence, Scott and Electromotors Ltd., as sales engineer attached to their Lancashire sales office.

Two new appointments concerning Scotland are announced by W. T. Henley's Telegraph Works Co. Ltd. **Mr. F. E. Saunders,** T.D., becomes

Mr. F. E. Saunders

Mr. F. J. Thornton

assistant manager of the company's Glasgow branch, and **Mr. F. J. Thornton,** succeeds him as Henley engineering representative for the whole of Scotland. Previously, Mr. Saunders was attached to the Glasgow branch as a representative and has acted as engineering representative for the whole of Scotland, while Mr. Thornton was formerly a representative attached to the company's Manchester branch.

Ekco-Ensign announce the appointment of **Mr. W. Fairhurst** as special representative attached to the Company's Midland sales office at 40-42 Summer Row, Birmingham. **Mr. R. M. White** has also joined this company recently as a representative. He will operate in certain areas of Hampshire, Dorset and South Wilts, and will be based at the Southern sales office, 5 Vigo Street, London W.1.

Until recently district engineer at Dartford, Kent, in the South Eastern sub-area of the London Electricity Board, **Mr. D. W. F. Starkey,** A.M.I.E.E., has been appointed to a similar post for the Kirkcudbright district of the Dumfries and Galloway sub-area of the South West Scotland Electricity Board in place of **Mr. D. M. Thornton,** now with the South East Scotland Electricity Board. Mr. Starkey took up his duties at Castle-Douglas this week.

Mr. W. M. Lloyd Roberts has been appointed deputy chief engineer of the Metropolitan Water Board. **Mr. H. F. Cronin** continues as chief engineer.

Previously assistant branch manager, **Mr. J. Stewart** has now been appointed manager of the Glasgow branch of Falk Stadelmann and Co., Ltd., in succession to the late **Mr. C. J. B. Gregg.**

Due to his modesty, we have only recently heard that **Major T. D. Childs,** sales engineer at the Glasgow office of Siemens Electric Lamps and Supplies, Ltd., was included in the New Year's Honours. He has been awarded the M.B.E. for his work in connection with the reorganisation of anti-aircraft communications in the west of

Scotland. Major Childs joined the telephone department of Siemens Brothers and Co. in 1929, and went to Glasgow in 1934 as sales and maintenance engineer to the private telephone department. Throughout the war he served in A.A. Command, first as brigade signal officer in Clyde area, and later, Portsmouth during the flying bomb period. On demobilisation in 1946 he was transferred by the private telephone department to Siemens Electric Lamps and Supplies, Ltd., as sales engineer.

Major T. D. Childs

OBITUARY

Members of the Institution of Electrical Engineers will learn with regret of the death on January 15, of **Mr. A. E. Rayner,** aged 63, who had served on the staff of the Institution for 47 years, until he retired from the post of assistant secretary early in 1947.

The death occurred recently of **Mr. L. R. Lee,** aged 83, who retired from the position of chief mains engineer of the Manchester Electricity Department in 1932 after 32 years' service there. At Manchester, he initiated a method of using vulcanised bitumen cable pitched in wooden troughing which was widely adopted. He also invented a copper strip system.

The death occurred, on January 12, of **Mr. J. Morgan,** O.B.E., A.R.C.SC., M.I.E.E., aged 60, who had been deputy regional director and chief regional engineer of the Welsh and Border Counties Region of the General Post Office since 1944. Between 1939 and 1944 he was chief regional engineer of the South Western Region of the G.P.O. He originally joined the P.O. in 1913 as an assistant engineer.

The death occurred on January 20 of **Mr. A. R. Milne,** B.SC.(Eng.), A.M.I.E.E., aged 46, production engineer with the British Electricity Authority, attached to the North-Western Division.

We note the death, on January 16, of **Mr. J. F. Bathgate,** of J. and J. Bathgate, electrical contractors, of Edinburgh.

We learn of the death, on January 16, of **Mr. J. R. J. Bowden,** A.C.G.I., A.M.INST.C.E., A.M.I.E.E., aged 77, who retired from the position of deputy borough electrical engineer at Hackney in February, 1940, after forty years' service there. He originally went to Hackney as an assistant engineer to Robert Hammond, the consulting engineer. Generally known as "J.B.," he was a founder member of the Institute of Fuel, and of the Chief Technical Assistants' Association. He was also an active member of the E.P.E.A.

Another electrical pioneer, **Mr. Edwin Powell,** died on January 17, aged 94. He founded in 1872 a motor-cycle and electrical engineering business in Tunbridge Wells, which subsequently became E. Powell, Ltd., of which he was chairman.

Appliance Manufacturers' Dinner

THE postponement of the ban on the use of non-ferrous metals for electrical appliances could not have come on a more opportune day since it was the occasion of the annual dinner of the B.E.A.M.A. Domestic Electrical Appliances Section. The occasion was a particularly delightful one with the Chairman, Mr. J. S. Warren, acting more with the informality of a compère when introducing the speakers and the excellent entertainment provided.

The choice of Mr. Philip Harben of television cookery fame was also a happy choice for the principal guest. For the toast of "The Section," he chose as a theme that cooking should be an art. Women, he said, exert great energy in sweeping and dusting the house, while she should have more electrical slaves to do this work so that she could spend more time in the kitchen. He was amazed that when he wanted a cooker he was asked how many people it had to cook for. The size of a cooker is determined by the type of meal not the number of people. He wanted more electric mixers and other devices so as to allow greater time for the more artistic side. The future of cooking, he said, lies in the electric cooker, but at present it has not advanced much since King Alfred's time.

The reply was by MR. F. L. HUMBER who assured Mr. Harben that manufacturers were trying to produce the slaves that he required, but they were handicapped by the controls on non-ferrous metals.

Mr. O. H. BUCKINGHAM proposed the toast "Our Guests," and referred to the representative nature of the gathering. In reply COL. B. H. LEESON, Director of B.E.A.M.A., spoke strongly on the capital limitation of electrical equipment. We cannot afford to do without this plant as the loss to industry in production is greater than the capital cuts. Turning to the shortage of raw material he said that the key was in American hands. The dollar shortage has been solved by their purchase of basic materials. We should now say to them that they must return some of these materials to us. In conclusion thanks were given to the chairman who, in replying, referred to the valuable work of the secretary, Mr. A. H. Gambling.

IRON LOSS MEASUREMENT

Theoretical and Practical Methods Described at I.E.E.

THE analysis of iron losses in electrical a.c. plant is a subject still of great interest to the research worker as well as to the plant builder. Two papers read at a Measurements Section meeting of the I.E.E. last week, showed an attack on the subject from two entirely different starting points.

Messrs. O. I. BUTLER and M. R. SARMA, in a paper entitled "Relaxation Methods applied to the Problem of A.C. Magnetisation of Ferromagnetic Laminae," gave details of a mathematical analysis using the technique developed by Prof. Southwell, and Mr. E. D. TAYLOR dealt with the practical problem of "The Measurement of Interlaminar Resistance of Varnish Insulated Silicon-Steel Sheet for Large Electrical Machines."

Relaxation Methods

In the Paper on relaxation methods, the classical solution of the problem of electromagnetism was used, and assumptions made that the lamination was magnetised by an exterior field acting solely in the direction of its length, that its thickness was much less than its width and that it had no ends. As these assumptions are very nearly the condition under which laminations are used in practice, the error introduced is small. Two further assumptions dealing with the hysteresis curve were also made; first, the hysteresis loop was assumed to be independent of frequency, and second the lamination was taken as homogeneous, both electrically and magnetically. With these assumptions, the authors were able to derive a finite difference equation suitable for manipulation by relaxation methods. Examples of practical working were given together with a discussion of the results obtained.

Measurements of Resistance

Of more direct practical interest was Mr. Taylor's paper. He pointed out that although the loss in a single lamination was classically divisible into the two components—eddy current and hysteresis loss—when the laminations were stacked under pressure, a certain amount of contact took place between adjoining laminations, giving an increase in the total eddy current loss as calculated from the individual sheets. This additional loss was the stray core-loss and was a function of the insulation between sheets. Even with varnishing, the irregularities in the surface of the laminations were sufficient to make localised contacts, and although the addition of several coats of varnish could minimise these contact points, they materially affected the space factor.

The Author then gave a statistical analysis of methods of measuring the mean effective resistance of sheets in contact by using sampling electrodes of various dimensions, and considered the effects of pressure, temperature and plate surface on inter-laminar resistance.

DISCUSSION

In the discussion, the majority of speakers concentrated on Mr. Taylor's paper. The opening speaker, MR. J. W. DALTON (E.R.A.) said that no method had yet been devised that could effectively be used to calculate the stray eddy current core loss. Only experience could show whether Mr. Taylor's method would satisfy the needs of designers. MR. C. E. WEBB (N.P.L.) dealt with the Relaxation Method paper and thought that it was misleading in giving figures to an accuracy of 1 in 10,000. He considered that the time was ripe for a standardisation of the method of measuring interlaminar resistance. The difficulty of using a statistical analysis for a problem apparently involving three dimensions was commented on by PROF. H. E. N. BARLOW (U.C.). He wondered if paper insulation would not be preferable to varnish. MR. J. MCFARLANE (G.K.N.) said that it seemed, if the conclusions in the paper were valid, that no possible reduction in varnish thickness could be achieved. The extension of the test to other types of insulation was suggested by DR. F. BRAILSFORD (M.V.) who thought that tests on paper insulation would have shown the stray loss to be a very small quantity. He considered that beside the loss due to low insulation resistance there were other sources of stray loss. MR. F. W. TAYLOR (Ferranti) felt that the surface of the steel was much more important than the different types of insulation. MR. A. C. SIM was of the opinion that the value of the resistance obtained by statistical methods was no better than that derived by previous methods. He suggested that the system proposed in the paper was only of use to the varnishing people and not to the designer. As far as Relaxation Methods were concerned he thought the publication of Messrs. Butler and Sarma's paper was premature, and only of academic interest until the results were verified practically. Finally, PROF. J. GREIG (Kings College) thought that the limitation to the method proposed by Mr. Butler and Mr. Sarma was the sheer labour of numerical computation.

Power Cuts and Industry

AN attempt to estimate quantitatively the effects of supply interruptions and voltage reduction on production in Great Britain has been made by Aims of Industry Ltd., an educational organisation aiming to "tell the story of the achievements and problems of free enterprise trade and industry." A questionnaire was sent to member firms, and a sample batch of 250 completed forms was completely analysed to obtain representative figures.

One hundred and fifty replies were found to be "nil returns," "don't knows," "no records available," or from firms generating their own power. The remaining 100 indicated a loss of 62,535 man hours, £38,432 financial loss to firms, and £6,198 wages lost by workers. If these totals are taken as representative of the 52,129 manufacturing establishments employing more than ten persons last June, then the man hours become 13·8 million, the loss to firms £8·5 million and the loss to workers £1·4 million, even supposing 60 per cent. of the firms to be unaffected by supply interruptions.

On the basis of the summary, the north-east coast appears to be the worst affected, while Sheffield has the greatest number of individual cuts.

Voltage reduction is debited with the largest single class of complaints. Many firms reported motors burned out due to such reduction, and a specially serious case came from a lift-making firm which reports several burn-outs in the installations it maintains. Where automatic lifts are in use, operation of the controls causes contactors to close, but the motor cannot get away, and the heavy current flows until the windings are damaged. More insidious is the effect on piece-rate workers: differentials between them and flat-rate operatives are reduced by the slowing of machinery and its stopping during cuts, and there is some fear that industrial unrest will result.

Firms that have installed their own generating plant complain of the heavy capital and operating expenses they have had to meet, and some complain that the investment aids the appropriate Electricity Board as well as themselves.

Sydney's Plant Programme Delayed

THE difficult labour problem in Australia is playing a major part in delaying the extensions and new building of power plant in the area administered by Sydney County Council. The Annual Report of the General Manager to the Council for 1949 shows that a heavy increase in load has occurred during the past few years, which is rapidly outstripping the generating capacity. In fact, restrictions on use have been in operation for some time. Although a considerable plant programme was initiated some years ago, progress has been disappointingly slow. Pyrmont "B" was held up due to labour shortage and lack of steel, despite the fact that most of the turbo-alternator components for the first set and the steam generating units were on site. The same story applies to the Bunnerong extension, which was delayed considerably due to difficulty in obtaining labour. For Lugarno, tenders have been invited for two 50 MW turbo-alternators and four 280 k lb./hour steam generating units.

On the operating side difficulty was experienced due to unsuitable fuel, which led in some cases to damage to the plant, and again skilled maintenance staff proved most difficult to obtain, and there was a continued high rate of turnover of employees with consequent wastage of training and supervisors' time which added considerably to the costs of maintenance.

Financial

Expenditure continued to show a sharp upward trend due to the advancing level of labour and material costs, mainly in respect of fuel and plant maintenance. Due to the shortage of coal, combined with the miners' coal strike, 59,340 tons of fuel oil at a cost of £580,185 were burnt compared with 21,880 tons at £238,001 for 1948. Although the coal consumption in 1949 was 57,963 tons lower than in 1948, the average price per ton was 6s. 6d. higher, involving an increased expenditure for the year of £170,131. The shortage of generating plant meant that maintenance had to be put on a continuous shift basis and costs increased.

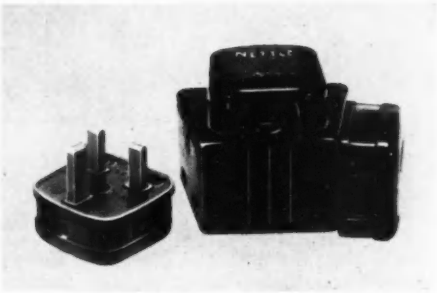
Sales for the year totalled 1,111·9 million units and, due to restrictions (particularly those in force during the miners' strike), this was 4·7% less than the 1948 figure.

Although a tariff increase operative from January 1, 1949, resulted in an income £734,913 greater than the 1948 figure, rising costs were sufficient to absorb this entirely and leave a net deficit of £817,813 on the year's trading.

The BUYER'S *Column*

Nettle Produce 13-amp Adaptor

NETTLE ACCESSORIES LTD., Harper Road, Wythenshawe, Manchester, have now produced a 13-amp fused 3-way socket-outlet adaptor to meet an increasing demand from the trade.



Nettle's new 3-way 13-amp adaptor

It is for use with all socket-outlets designed in accordance with B.S. 1363. Overloading is prevented by the provision of an easily replaced 13-amp fuse contained in its own carrier in the adaptor, thus obviating the necessity of dismantling the adaptor for fuse replacement. Polarity is similar on all outlets.

New Accessories by Falks

RECENTLY introduced by FALK STADELMANN AND CO. LTD., 91 Farringdon Road, London E.C.1, was a new range of a.c./d.c. shuttered 3-pin 5 and 15 amp switch and socket outlet assemblies.

Main features are the heavy gauge face plate, a robust-kick dolly to the switch which has a moulded base incorporating a strong, secure terminal housing, easy wiring terminals, and a moulded plug to B.S.S. with single screw adjustable cord grip.

The units are extremely robust, are shallow yet permit ample wiring space and are fully rated. They are available for 5 or 15 amps double or single pole switching and are available in cream coinage bronze or black finishes.

Philips' Range of Variable Transformers

THE range of variable transformers, built on the auto-transformer principle by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London W.C.2, is now extended to include ten different types varying in output from 130 VA to 2,080 VA. Those having a capacity of 130-520 VA are housed in a "Philite" casing, whilst the heavier types with 1040 VA and higher have a metal casing.

The bench types in "Philite" housings have a safety fuse in the brush lead, and are supplied with two spare fuses.

With these transformers, which are fitted with a graduated scale and a knob, a secondary voltage can be obtained that is variable from 0 V to 20% above the nominal primary voltage; the maximum output with any secondary voltage is limited by the permissible secondary currents listed in the table below, which may not be exceeded.

Output VA	Secondary V	Secondary A	No-load losses W	Type Nos.	
				Building-in Type	Bench Type
130	0-260	0·5	5·6	84512	84513
260	0-260	1·0	6·8	84514	84515
520	0-260	2·0	9·0	84516	84517
1,040	0-260	4·0	17·0	84518	84519
2,080	0-260	8·0	25·0	84520	84521

The efficiency of these variable transformers is high, the graduated scale permits exact regulation to the fraction of a volt, and owing to the low voltage loss there is constant regulation.

They are of simple but robust construction and, if properly used, should have an unlimited service period.

"Hyliter" in Three New Finishes

THE Amhurst "Hyliter" spotlight, by COURTNEY POPE (ELECTRICAL) LTD., Amhurst Park Works, Tottenham N.15, is now available in three new finishes, apart from the standard cream, at no extra cost. These finishes are anodised aluminium, anodised gold and anodised "Princess" bronze.

Advance in Prices

AN increase on the March 1950 price lists as from 22 January is announced by JULIUS SAX & CO., LTD., 24 Commerce Road, Brentford. Prices are now plus 110% advance and less 25% trade discount which cancels the existing 100% advance.

One of Philips' new variable transformers

Exide, New Unspillable Cell

THE latest addition to the range of radio cells and small accumulators manufactured by CHLORIDE BATTERIES LTD., Clifton Junction, near Manchester, is the new Exide unspillable LPM4 in moulded polystyrene container.

This cell was designed principally for "walkie-talkie" apparatus, although it should also prove equally suitable for certain domestic radio receivers.

The polystyrene container offers many advantages to the user of the LPM4, particularly in countries overseas. It remains unaffected by wide variations in temperature, thus ensuring a long life for the cell even under tropical conditions.

The separators are constructed of Lignex—a highly absorbent wood fibre material that greatly reduces the quantity of freely mobile acid in the cell. This type of separation combined with the specially designed lid prevents acid spillage in service, even on inversion. These cells can be supplied and stored in a dry condition, thus eliminating the necessity of frequent freshening charges and the possibility of deterioration whilst in stock.

The terminals—non-interchangeable and heavily insulated—are situated well away from the gas vent and pillar seals so that the risk of corrosion is minimised. Gravity beads floating in the electrolyte provide an approximate indication of the cell's state of charge.

Specification

Voltage 2

Capacity 30 amp/hr at the 20-hr rate

Overall Dimensions $6\frac{7}{8}$ in. wide x $2\frac{3}{8}$ in. long x $4\frac{3}{8}$ in. high

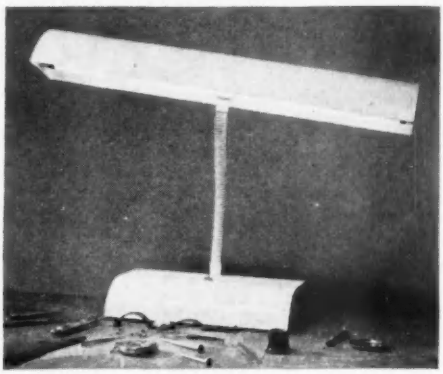
Charge rate 2 amps

Nickel in Engineering

PRACTICAL information on important engineering materials is given in two booklets which have been sent us by HENRY WIGGIN AND CO., LTD., Wiggin Street, Birmingham 16. The first is a 20-page publication listing in concise tabular form the relevant engineering properties of Monel, nickel and Iconel. The second handbook, which runs to 52 pages, is packed with carefully presented practical advice and data on the hot working, annealing and pickling of the three metals. Both publications are available, free of charge, on application to the firm at the address given above.

"Specialist Lighting"

DESIGNED especially for those people engaged on delicate instrument assembly work and suitable also for artists, engravers and other craftsmen is the "Specialist" fluorescent desk lamp now available from SCEMCO LTD., Soho Street, London W.1.



Scemco's "Specialist" for fine work

The reflector incorporating a 2 ft 20 W bi-pin tube is mounted on a flexible metallic tubular stem easily adjustable at any angle or position. Balance is ensured by the fitting of the control gear into the base plate.

Constructed of sheet steel and finished in high gloss enamel, the lamp represents good value, complete with tube at £6 17s. 6d.

Dimensions of the "Specialist" are as follows: Overall height, 16 in.; reflector length, 24 in.; base length, 12 in. by 8 in. wide. A miniature glow canister starter switch is incorporated in the circuit. Approximate weight is 9 lb.

Listening and Learning

FOR use in schools where there is a need for a smaller mains-operated receiver-amplifier, AUDIX B.B. LTD., of Hockerill Works, Bishop's Stortford, Herts, have produced the model R.A.11.

This unit is capable of feeding up to six loudspeakers. Features which have proved satisfactory in other Audix models have been built into this superhet receiver. It is housed in a polished hardwood cabinet and has a large tuning scale calibrated in wavelengths with all B.B.C. stations clearly marked.

A small speaker is incorporated for monitoring the programme, a tuning indicator for accurate station setting is provided, and a special tone control gives degrees of tone for speech and music.

For mains switching a key is provided which will prevent operation by unauthorised persons. Gramophone unit connection sockets are provided for record reproduction.

Power output is 10 W with less than 2% harmonic distortion; output impedance is 3 to 15 ohms. Price of the R.A.11 is £22 10s. plus £1 13s. 8d. purchase tax.

Brush Build 3 New Battery Electrics

DURING the year 1950 BRUSH COACHWORK LTD., Loughborough, Leicester, introduced three new battery electric vehicles. They were:

A prototype 3-wheel drive tractor with a towing capacity of 4 to 8 tons. The vehicle has a handsome appearance and has twin electric motors, one driving the front wheel, the other the rear axle. The motors are differentially coupled electrically, the rear drive being via conventional shaft and differential.

Now in full production by the firm is the "Cob" electric tractor. It has an unusually low turning radius of 4 ft ½ in., and will pull loads of up to 4 tons. Demand for this model is good, high performance, low running cost and ease of maintenance proving the best proposition for users of this type of vehicle.

The third model introduced was the Pony mobile food and drink kiosk. This model provides an economical and hygenic mobile canteen for use in all places where crowds may gather.

"Wolf" Building Hammer Kit

AVAILABLE now from WOLF ELECTRIC TOOLS LTD., Hanger Lane, Ealing, W.5, is a complete building and maintenance electric hammer kit which includes the popular HD1 electric hammer.

This electric hammer weighs 7 lbs. and has an effective striking power of 1,600 blows per minute. The motor is an exclusive Wolf design and the hammer mechanism is covered by world patents.

The hammer, cable and accessories fit into an attractive strongly built steel case. For general wall-plugging, the kit includes Rawldrills Nos. 6 to 22, a holder and a tommy bar with ejector. ½ in. and ¾ in. stone mason's chisels, comb holder and six combs, 2 in. scaling chisel, a chasing bit, holder and ejector are included for light chasing and cutting, combing, chipping and scaling. For connecting extra cable there is also a spare "Niphan" plug and socket.

"Wolf Tools" building hammer kit is a complete working outfit

Sight is Worth Saving

IN many hundreds of factories throughout Britain, work-people engaged on processes which involve the use of dangerous chemicals and the emanation of dust, fumes and powders have adopted the "Panorama" all-purposes safety goggles to protect their precious sight.

There are many different patterns in the "Panorama" range, made by STRATFORD PRODUCTS SAFETY SERVICE CO., LTD., 98 Tower Bridge Road, London S.E.1. They included the all-purpose models, transparent "Perspex" face shields, heavy duty models and welding goggles, and are available in crystal clear or coloured "Perspex."

In our illustration the operative is seen wearing the all-purpose 212 "Panorama" goggles. These weigh only ¾ oz. and afford complete protection and perfect ventilation. The goggles are optically correct and give no distortion, they are comfortable to wear even for those people who wear spectacles normally.

TRADE PUBLICATIONS

LIGHTING FITTINGS.—Hume Atkins & Co., Ltd., 66 Victoria Street, London, S.W.1, make a range of attractive lighting fittings both for filament and fluorescent lamps and sturdy yet pleasant convector heaters. They are surveyed in a brochure on these "Raylux" products.

MACHINE TOOLS.—Two leaflets have been issued by the Lapointe Machine Tool Co. of Edgware, Middlesex, describing their latest SRV and DRV ranges of British built, vertical broaching machines.

TELEPHONE EQUIPMENT.—"Strowger equipment afloat" is the title of a brochure issued by the Automatic Telephone and Electric Co., Ltd., Strowger House, Arundel Street, London W.C.2. Its title is self-explanatory.

COOKER SWITCHES.—The "Turnright" cooker switch, which we featured in our June 29 issue last year, is the subject of a new leaflet issued by Turnright Controls Ltd., West Hill, Hoddesdon, Herts.

New Literature

Electric Fuses

by H. W. Baxter, B.SC.(ENG.), A.M.I.E.E.

SIMPLICITY in construction is one of the marks of the electric fuse, probably the earliest form of electrical protective gear. This simplicity does not, however, extend to the design and operation of the device, for a most complicated interaction of thermodynamics and gas discharge phenomena has to be taken into account in developing a satisfactory theory. The Electrical Research Association has been investigating these matters for many years now, and the present volume has been published to make available the results of these researches in a compact and convenient form.

The contents split naturally into two parts, the first of which is concerned mainly with the semi-enclosed type of fuse, and with low current operation. In the second section are given the results of a systematic investigation into the operation of cartridge type fuses at both overload and short-circuit currents. Useful notes on test methods and equipment and on various official specifications for fuses complete the book, and add greatly to its value. Fuse designers will welcome the handiness of the volume, but it is important to note that it does not claim to be, and is not, a balanced textbook on fuse operation and design. Published by Edward Arnold and Co., 199 pages, 8½ in. by 5½ in. Price 21s.

Electric Wave Filters

By F. Scowen, B.SC., A. INST.P.

COMPLICATED mathematical theory underlies the design of the electric wave filters used in communication engineering, but the end products of the theory are easier to handle. In this volume, the necessary mathematics is effectively revised in a compact first chapter, and the basic electrical theory is similarly covered in a short chapter two. The theory and design of filters is then developed in an orderly manner, several designs being worked out in detail. This is the second edition of the work, the main change being the addition of a section describing Darlington's insertion-loss method of filter design: it can be recommended to all engineers who require a book on the subject. Published by Chapman and Hall, 188 pages, 8¾ in. x 5½ in. Second edition, price 18s.

BRITISH STANDARDS

Electrical Refrigerators and Food Freezers for Household Use in *All Climates. B.S. 922:1950.* **Electrical Refrigerators and Food Freezers for Household Use in** *Temperate Climates only. B.S. 1691 : 1950. Price 3s. each.* These British Standards prescribe the general constructional requirements, the methods of determining the performance and computing the volume and shelf area of electrical refrigerators designed for household food storage and of electrical refrigerators designed as household food freezers and having a net volume up to and including 12 cubic feet. Definitions of some of the terms used have also been included. The two standards differ from one another only in respect of temperature ranges and minima test pressure ranges. B.S. 922 has been enlarged from its 1940 form to cover food freezers for household use. B.S. 1691 is complementary to No. 922.

Methods of Testing Vulcanised Rubber. *B. S. 903: 1950. Price 21s.* A revision of the 1940 version of this standard has now been issued, providing for standardised methods of analysis and tests for vulcanised rubber, both for the purpose of providing methods for use in British Standards and to provide a set of reliable methods for use by all those concerned with the analysis and testing of vulcanised rubber.

It is pointed out that in addition to a great number of tests which are now in general use having been added to the original standard, the scope of the document has been widened to cover synthetic rubbers as well as natural rubber. It is, however, not implied that every test described is appropriate or suitable for all types of vulcanisate.

The document has been drawn up in such a way that closely related methods are grouped into a self-contained paper with a distinctive number.

Guards for Couplings and Associated Shafting. *B.S. 1649 : 1950. Price 2s.* A new standard has been published which will be of interest and value to all those who are concerned with preventing accidents due to rotating parts. In this new standard, which takes note of the Factories Act, 1937, and has been prepared with the co-operation of the Engineering Branch of the Factory Department of the Ministry of Labour and National Service, general requirements have been laid down for guards which should be applied to couplings between units such as a motor and a pump, and also guards that are required for a length of shafting and coupling.

Attention is drawn in the foreword to certain features of the regulations dealing with the provision of safety requirements. The specification itself lays down the necessary requirements to ensure that a guard will have sufficient strength and be suitable for its purpose. In addition, one appendix shows different forms of guards and a second appendix gives recommendations for the responsibility of provision of guards.

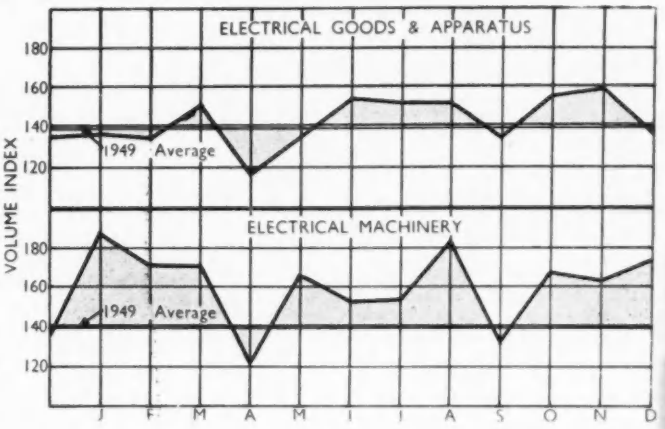
British Standards reviewed above may be obtained, post free, at the prices indicated, from the British Standards Institution, Sales Department, 24 Victoria Street, London, S.W.1.

EXPORTS AND IMPORTS

EXPORT VOLUME INDEX

December trade returns show, as usual, a drop in the value of electrical goods and apparatus exported to £6,741,626, 135% of the average monthly volume during 1947, when adjusted for price changes. Electrical machinery valued at £4,200,109 was exported, equal to 173% of the 1947 figure on the same basis.

For the whole of 1950, exports of electrical goods and apparatus averaged 143% of 1947, as against 139% for the previous year. Corresponding values for electrical machinery were 162% (1950) and 140% (1949).



NOT unexpectedly, the value of all electrical goods exported during December last was a decrease on the preceding months, yet the total of £11,390,476 is a notable increase over the figure for December, 1949. Although the drop in exports applied to most electrical goods, the month's high figure of £1,139,004 for generators not exceeding 200 kW will be noted. Of this total the Soviet Union's share was £883,869.

Of electric cooking and heating appliance, exported, irons alone accounted for £47,836 of the total. Australia was again our best customers taking all types of electrical goods to a total value of £1,512,225 during the month. Corresponding figures for other countries were: South Africa £1,180,236, Russia £915,913, India £836,677, and New Zealand £453,097, while Canada took goods to a value of £220,371.

Description	Exports Value Month of December			Imports Value Month of December		
	1948	1949	1950	1948	1949	1950
	£	£	£	£	£	£
Telegraph and Telephone Wires and Cables—						
Submarine	21,144	106,621	143,622			
Other	712,393	777,761	642,176	7,815	12,519	4,375
Rubber Insulated	416,738	262,793	365,494			
Insulated, other than Rubber	951,977	790,633	728,728			
Wireless Apparatus, including Valves	997,349	933,480	1,537,605	48,265	111,109	196,883
Telephone and Telegraph Apparatus	1,182,460	1,353,254	1,170,480	6,766	4,697	7,677
Electric Lighting Appliances, Accessories, Fittings and Parts:—						
Bulbs and Discharge Lamps	133,951	158,588	159,999	8,925	13,902	21,516
Other Descriptions	445,888	302,655	263,813	2,659	28,582	36,743
Batteries (primary)	87,562	81,173	156,438	—	—	—
Accumulators, Portable	156,588	213,100	205,397	—	—	—
" Stationary	16,922	34,076	21,705	—	—	—
" Parts and Accessories	87,386	104,880	52,663	—	—	—
Electrical Cooking and Heating Appliances	292,345	219,657	295,399	—	—	—
Ammeters, Voltmeters, etc., and Parts	82,435	90,296	111,638	15,976	40,255	28,528
House Service Meters	201,664	62,522	110,297			
All Other Instruments	59,331	102,041	136,433			
Electro-Medical Apparatus	40,734	29,735	43,840	—	—	—
X-Ray Apparatus, etc.	41,337	81,399	57,311	24,413	26,145	14,559
Insulating Materials	153,252	152,284	169,334			
All Other Articles	410,778	414,551	369,254	64,539	109,206	103,803
TOTAL OF GROUP	6,492,234	6,271,499	6,741,626	179,358	346,515	414,084
Electrical Machinery:—						
Generators (not exceeding 200 kW)	476,910	376,501	1,139,004	1,879	25,214	30,634
" (exceeding 200 kW)	100,924	158,266	350,872			
Parts	60,280	138,600	136,309			
Motors	824,850	641,585	744,255	25,346	25,775	18,486
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,227,141	1,693,067	1,829,669	4,714	23,456	8,150
Fans, Electrically and Power Driven	144,871	160,909	98,003	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	273,684	264,163	350,738	7,838	33,214	11,789
TOTAL APPLIANCES AND MACHINERY	9,600,894	9,704,590	11,390,476	219,135	454,174	483,143

THE WEEK

INDUSTRY *in news* COMMERCE

Exporting to Canada

A NEW publication entitled "Exporting to Canada" has been compiled by the Board of Trade to help British manufacturers maintain a high level of exports to dollar markets. It differs from the series of overseas economic surveys in that it concentrates on the more immediate and practical problems, and provides a brief summary of useful and factual information. Among its pages may be found details of Canadian Government restrictions, duties and taxes, and helpful data on such matters as shipment freights, samples, and choice of agents. Lists of Canadian fairs and exhibitions will also be found of great assistance.

Although this information is by no means exhaustive, the book is an admirable guide to the exporter unfamiliar with the market, while the more experienced manufacturer will also discover much to his advantage in the volume. It is available from H.M.S.O., and is priced at 2s. 6d.

Festival Display Contest

IN response to numerous requests from local authorities and trade associations, the British Display Association has undertaken to organise a Festival of Britain Display Competition, provided it can obtain adequate support from manufacturers. It is hoped that the necessary funds for the contest will be raised by subscriptions from firms in ten trade groups whose products are sufficiently widely distributed throughout the country. One such trade group comprises electrical and radio goods, and the B.D.A. is inviting twenty manufacturers in this category to subscribe £50 each. In return the products of subscribers will be prominently featured in the competition displays. From the £10,000 raised in this way, £7,000 will be assigned to 360 cash prizes and the remainder to administrative purposes.

For those who may want to compete, we understand that the first prize in each group will be £200. There will also be 15 area prizes of £20 and 20 additional awards of £10. Manufacturers wanting to co-operate in the scheme are asked to communicate with the secretary of B.D.A. at the Goring Suite, Chronicle House, Fleet Street, E.C.4.

Apprenticeship Training

AN apprenticeship manual that has an interest for a wider range than parents and prospective trainees has been prepared by J. and E. Hall, Ltd., Dartford Ironworks, Dartford, Kent. Many interesting sidelights on the company's history are given in an introductory section, while the modern picture is presented by descriptions of various works now operating.

The business part of the brochure gives details of the courses available for trade and technical apprenticeships and engineering studentships, and illustrates these extensively. Copies of the brochure are available from the address given above.

Wage Increase for B.E.A. Employees

AN immediate increase in pay for manual staff in the Electricity Supply Industry has been agreed upon. The National Joint Industrial Council for the Electricity Supply Industry at its meeting on Friday last, decided that the wages of trades set out in Schedule (*a*) of the National Agreement of July 20, 1949, as amended from time to time, shall be increased by 1½d. an hour from the pay-day in the week commencing January 29, 1951, for the period covered by that pay-day. This increase will apply to approximately 110,000 employees, and, on the basis of a 44-hour week, will mean a rise of 5s. 6d. a week to all grades of workers in the generation, transmission and distribution side of the industry.

T.V. for West Country and Wales

THE B.B.C.'s new high-power television transmitter to serve the Bristol Channel area, is to be situated on St. Lytham's Downs, near Wenvoe, five miles west of Cardiff.

The new station will serve an area approximately bounded by a line through Barnstaple, Teignmouth, Swanage, Marlborough, Chepstow and Brecon, Carmarthen and Tenby, an area which has a population of about 3½ million.

The Wenvoe site covers approximately 25 acres near the Cardiff-Swansea road. It is to have a 750 ft mast, similar to the Sutton Coldfield mast, which is to be built by B.I. Callenders Construction Co. The vision transmitter by E.M.I. has

The First Half-Century

It is not possible even in the columns of a technical paper to pass over in silence the event that has plunged the whole world in mourning: the death of our beloved Sovereign, Queen Victoria. As in length of days and in the duration of her reign she surpassed all her predecessors, so did she in the respect and affection of her subjects.—*From our issue of January* 24, 1901.

a power of 50 kW, whilst the sound transmitter by Standard Telephones and Cables is of 12 kW.

This station departs from previous practice in that the carrier wave will be modulated by the vision signal in a low-power stage instead of the output stage as in previous transmitters.

Housecraft Advisers' Conference

EXPECTED attendance at the 1951 Electrical Housecraft Advisers' Conference, to be held at the Cowdray Hall, Henrietta Place, London W.1, opening Wednesday, March 7, is 400.

Advisers, demonstrators and showroom assistants from all parts of Britain will be attending the conference organised jointly by E.D.A. and E.A.W.

Speakers will include Miss Brown, adviser on hospital domestic management to the Ministry of Health, Mr. J. I. Bernard, of E.D.A., who will speak on "Washing Machines, Ironing Appliances and Drying Cabinets," and Miss Bailey, of E.A.W. whose subject will be "Modern Laundry Practice: Soaps and Detergents."

On Friday, March 9, the conference will be held in the Connaught Rooms, Great Queen Street, where Philip Honey, of E.D.A., will speak on "Refrigeration," and Miss Jackson, of Electrolux, Ltd., will give a demonstration of cold cookery.

Sign Manufacturers at M. o. F. & P.

A DEPUTATION from the Electrical Sign Manufacturers' Association met the Parliamentary Secretary of the Ministry of Fuel and Power at the weekend to discuss the problems arising out of the ban on advertisement lighting.

The deputation consisted of Mr. S. D. Moyse, Mr. C. S. Campbell, vice-chairman of the Association, Mr. J. H. G. Pearce and Mr. F. F. Newlands.

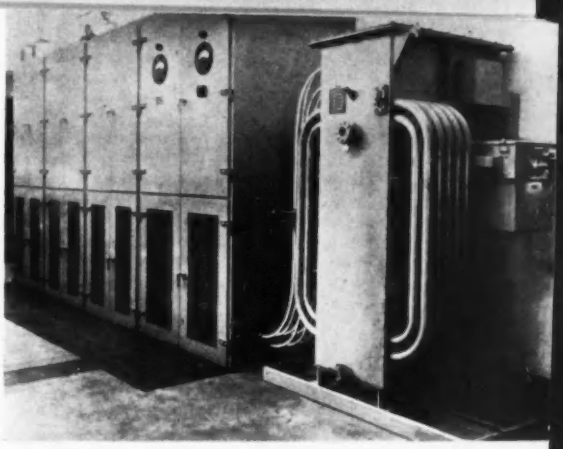
After assuring the deputation that the ban was only a temporary feature necessitated by the acute fuel shortage, the Parliamentary Secretary undertook to meet the Association again during March.

Money from Meters—An Appeal

EASTBOURNE police are to appeal against the recent decision of the local Magistrates' Court, when two charges of larceny against Mrs. J. E. Parker were dismissed. The case originated last May, when, as we reported, the accused was charged with stealing the contents of gas and electricity meters—£4 14s. 5d. and £1 1s. 9d. respectively—on premises occupied by Mrs. Parker and her husband. At that time the magistrates dismissed the charge, considering that there was no case to answer, but, on appeal, the High Court has directed that there was. On November 20, the local Bench, after hearing the defence, again dismissed the proceedings.

Manchester–Sheffield Electrification

AUTUMN this year should see the opening of the first section of the Manchester-Sheffield-Wath electrification scheme, i.e., between Wath and Dunford Bridge. The overhead conductor steelwork has now been erected along 70% of the route but so far less than 10% of the wiring has been completed. It is improbable that the complete scheme will be in operational order before 1954 in view of present day stringencies.



Rectifier equipment made by Nevelin Electric Co., Ltd., for the Bristol Aeroplane Co.'s works, showing, in the foreground, the transformer and its specially extended base essential to spread its weight. The rectifier has an unusually low voltage regulation, and the site conditions limited the weight to 200 lb. per sq. ft. These factors necessitated a special design, but nevertheless the job was completed in ten weeks

One of the locomotives is to be shown at the Festival of Britain Exhibition, whilst three are operating on test on the Liverpool Street-Shenfield line. Four other locomotives have been completed and another six are in production at British Railways' Dukinfield works.

Sixfold Increase in 'Frig Production

MORE than six times as many refrigerators are being produced today as in the years before the war, according to recent figures issued by the British Refrigeration Association.

Production in 1935 was just over 3 million units, whilst 1949 output was 20,305,205. The first half of 1950 shows a trend towards an even greater yearly total, some 12 million being produced of which over 4½ million were exported.

Rota System on Merseyside

A ROTA system for power cuts has been introduced in part of the Merseyside and N. Wales area. Last week advertisements appeared in the local press in the Wirral and Chester sub-area, which includes Birkenhead, showing which districts could expect cuts on each day of the week. We understand that technical difficulties make it impossible to introduce a similar method for Liverpool and Southport, but it is intended to inform the Press daily of districts liable to be affected on the following day. Rotas for the Manchester and Preston sub-areas are being advertised this week, and the system will go into operation almost immediately.

Brush Film Show

IN order to illustrate to overseas buyers the capabilities and resources available at their works

for the manufacture of diesel engines, diesel-driven generators, and turbo-generating plant, the Brush-Aboe group of companies have produced a film entitled "Power" for special showings.

This tells the story of the development of the Ljungström turbine, and illustrates its manufacture in the Brush Co.'s Loughborough works. It then shows the extension of the company's activities to the diesel field, and gives glimpses of the manufacture of all sizes of diesel plant at the associated works of Mirrless, Bickerton and Day, Stockport; J. and H. McLaren, Leeds; Petters, Ltd., Staines, and Meadows, Ltd., Wolverhampton.

At the premiere last week, Mr. G. R. Strauss, Minister of Supply, thanked the Aboe organisation for its striking contribution to the building-up of our economic stability. He paid a tribute to its great work in the past, and expressed his best wishes for the company's future trading. Sir Ronald Matthews, J.P., took the chair.

Save Waste Paper

THE Waste Paper Recovery Association is appealing for the co-operation of all trade and professional associations, to ensure that every scrap of waste paper is saved. The target for this year is the collection of a million tons of paper. Packaging materials for both defence and export needs would claim priority, and adequate requirements for the home market could only be achieved by the recovery of greater quantities of unwanted paper, stated the Association's general manager last week. No less than a million tons will be needed, he said, which was nearly 25% more than was saved last year.

Amateur Wiremen Warned

WELTON Rural Council in Lincolnshire have issued warnings to the tenants of all Council houses that they must not interfere with the electrical installations in their homes.

This action resulted from the discovery in premises at Saxilby that the installations had been tampered with so much that there was a danger of fire and electric shock. The tenant concerned has been ordered to have his installation replaced, as first planned, by an authorised electrical contractor.

Telcon helps Fight against Cancer

EMPLOYEES of the Telegraph Construction and Maintenance Co. Ltd. works were quick to respond to an appeal by the Mayor of Greenwich for funds for cancer research. They held a grand concert in the canteen at Telcon works last week, attended by over 250 employees and their friends.

Mr. L. R. Letton, secretary of the Telcon Social and Athletic Club, estimated that the cancer research fund will benefit to the extent of £20 as a result of the concert.

Street Lighting in "Seeboard" Area

DETERMINED, despite the "unofficial" cut in street lighting, to keep their consumers and local authorities well aware of modern developments in electric street lighting, "Seeboard's" Surrey and Croydon and West Kent sub-areas have arranged an Exhibition of Street Lighting at their Rough Rew sub-area headquarters from January 22 to 26.

Concurrent with the exhibition is a daily conversazione on the subject. The programme is as follows: 2.30 p.m., "The British Standards Institute Draft C.O.P. for Street Lighting," a talk by H. E. G. Wates, A.M.I.Mech.E., or E. B. Sawyer, F.I.E.S., followed by discussion; at 3 p.m. a talk by C. R. Bicknell, B.Sc., F.I.E.S., or A. D. S. Atkinson, A.M.I.E.E., F.I.E.S., entitled "Light Sources." The Ministry of Transport film, "Modern Street Lighting," too will be shown daily at 3.30 p.m.

Rough Rew H.Q. is in Ridgeway Road off the Horsham Road at Dorking. L.T.E. Buses 414 and 439 pass Ridgeway Road.

This is a section of the "rough terrain" that confronted Pirelli General Cable workmen when laying a large capacity 132 kV cable connection between the new Brunswick Wharf station and the main distribution centre at Islington some 7 miles away. Here the cable crosses the Regents Canal, via a specially constructed cable bridge, alongside the 300 years old Gunmakers Arms Bridge

Hooter warnings of Power Cuts

FACTORY hooters are likely to be used at Stroud as a warning to industrialists and domestic consumers of impending power cuts. Numerous suggestions for power cut warnings have been made in various areas during recent months, but we believe this to be the first positive action to be taken in the matter during the present shortage. The Midlands Electricity Board has agreed to co-operate in the experiment provided local industrialists can evolve an effective system. The plan is to restart four or five steam hooters in the district, which would give thirty seconds continuous warning for every unnecessary domestic or commercial electrical apparatus to be switched off.

The procedure for such a scheme was explained by S. H. C. Morten, the meter and technical engineer in the sub-area, which was that a signal would be sent to every point where the local committee had a hooter. This would be blown immediately, after which the Board would observe the load every 75 seconds, noting the reduction. Difficulties raised against the scheme were that only 2¼ minutes' warning could be given, and that sufficient voluntary load shedding would have to take place within one minute of the warning in order to avoid a cut. Both these periods were considered too short to be effective. The system would, however, be superimposed on the present district load shedding scheme. If the warnings were successful there would be no load shedding, but if they failed there would be a reversion to shedding.

Centralisation in Coventry

THE former Daimler offices in Sandy Lane, Coventry, are to be the new headquarters of the Coventry Sub-Area, East Midlands Electricity Board as from mid-February, when employees will leave their present Council House and Corporation Street offices. The engineering side of the sub-area organisation is already in Sandy Lane in premises adjacent to the new headquarters.

As from April 1 the Board will take over the collection of accounts from the City Treasurer's Dept.

Cocktail Bar lighting in "Q.M."

LIGHTING installations in Cunard liners have formed an important part of British Thomson-Houston Co.'s contracts in recent years, so that it was not surprising when the R.M.S. *Queen Mary* docked at Southampton for its latest refit and a new cocktail bar planned, that the company was again called in. Nine units were required for the new bar, and the style chosen was the Mazda

The new "Mermaid Bar" aboard R.M.S. "Queen Mary."

One of Benjamin Electric's new silk-screened showcards produced for their stockists. Each is in five colours and measures 15 in. by 8 in.

ship-lighting fitting of standard design S.10113. This type has a polished silver bronze framework and satin finished glass dish. Overall diameter is 17 in., depth is 5 in., and each fitting houses three 60-watt tungsten filament lamps. The Worcester firm, G. T. Rackstraw, Ltd., were contractors for the installation.

Leaflet scheme Rejected

THE subject of benefits to be derived from the distribution of simple leaflets explaining the work and purpose of Consultative Councils have been on the agenda of many Council meetings in recent months. The latest discussion on the matter was at a meeting of the S. Wales Council in Cardiff last week, where the proposal was rejected, and described by one member as a waste of money and valuable paper. Members discussed the distribution of 40,000 similar leaflets in the N.W. area, but it was doubted whether the wording was sufficiently simple for housewives to understand the explanation.

Electric Supply News

B.E.A

We referred last week to the record total of 1,034 MW of new generating plant installed by the B.E.A. in 1950. Corresponding figures for 1948 and 1949 are 503,250 kW and 826,250 kW respectively. The highest pre-war total was in 1938, when 761,500 kW was added. For the record, we give the following table of the plant installed during 1950.

Station	Generating Plant No. and capacity (kW)	Boilers No. and capacity (lb./hr.)
Agecroft, Salford, Lancs.	2 × 52,500	2 × 315,000
Cliff Quay, Ipswich ...	2 × 45,000	1 × 365,000
Clyde's Mill, Glasgow ...	1 × 30,000	2 × 180,000
Croydon	2 × 52,500	2 × 320,000
Dunston "B," Durham	1 × 50,000	2 × 410,000
Ferrybridge, Yorks ...	1 × 45,000	4 × 180,000
Hartshead, Cheshire ...	—	1 × 150,000
Hayle, Cornwall ...	1 × 20,000	1 × 200,000
Kearsley, Lancs ...	—	1 × 173,000
Kingston "B," Surrey ...	1 × 30,000	3 × 260,000
Leicester	1 × 31,500	2 × 175,000
Littlebrook "B," Dartford, Kent	1 × 60,000	2 × 265,000
Llynfi, nr. Cardiff ...	—	1 × 300,000
Neepsend, Yorks ...	1 × 50,000	1 × 190,000
Nottingham	1 × 52,500	4 × 320,000
Poole, Dorset	1 × 50,000	1 × 300,000
Portobello, Midlothian...	—	1 × 450,000
Rotherham	1 × 30,000	—
Staythorpe, nr. Newark	2 × 60,000	5 × 240,000
Stourport "B," Worcs	1 × 60,000	1 × 525,000
Thornhill, Yorks ...	1 × 45,000	1 × 180,000
Walsall, Staffs	1 × 30,000	2 × 150,000
	—	2 × 180,000
West Ham	1 × 30,000	3 × 180,000

Douglas (I.o.M.)

A complete revision of the existing tariffs proposed by Mr. C. Anderson, borough electrical engineer, came before the town council recently. Under these the flat rate for lighting, become 7¼d. p.u. for the first 1,000 p.q., 6¼d. for the next 2,000, 4¼d. for the next 2,000 and 3d. p.u. for all over 5,000 units p.q. The old rate was 7¼d. p.u. for the first 2,000 units and 6¼% all in excess, plus 5%. The new flat rate for power (including cooking, heating and water-heating) is 2¼d. p.u. for the first 1,000 units p.q., 1½d. p.u. for the next 2,000, 1d. p.u. for the next 2,000 and 7/8d. p.u. all over 5,000 units p.q. Previously the rate was 2d. p.u for the first 3,000 units, 1½d. for the next 3,500, and 1¼d. all over 7,000, with a charge of 1d. p.u. for cooking and 7/8d. for heating and water-heating, all plus 5%. Under the proposed all-in tariff for dwelling houses, there is a fixed charge of 3½% of the rateable value, plus 1d. for the first 250 units p.q., 7/8d. for the next 250 and ¾d. all over 500 units p.q. The old all-in tariff provided for a fixed charge of 5% of R.V plus 1d. p.u., or 7/8d. p.u. with cooker or water-heater, or ¾d. with both cooker and water-heater mistalled, all plus 5%. It is proposed that the domestic all-in tariff will not apply to boarding-houses with more than five bedrooms, charges for current through slot meters are unchanged, but hire charges are to be increased to allow for the deletion of the 5% surcharge, and all charges for meters, cookers, water-heaters, etc., will be increased by about 5%.

In making these proposals, Mr. Anderson pointed out that, in spite of considerable increases in costs, Douglas tariffs had not been raised since 1943, the rapid growth in load produced extra revenue. Now that a bulk supply is no longer given to the Isle of Man Electricity Board, operating costs were uncertain. The tariff revision must be regarded as an interim measure.

Malvern

A modified scheme of the Midlands Electricity Board to carry electricity across Malvern Hills was discussed at the meeting of the Area Electricity Consultative Council last week. It was explained that, under the revised scheme, wooden poles are proposed, and only one pylon would be visible from any part of the district. The scheme would cost £20,000 less than the laying of underground cables and would bring supplies to rural Herefordshire in a reasonable time instead of several years. All local authorities had supported the amended scheme except the Malvern Urban Council and the Malvern Hills Conservators, it was stated.

North of Scotland

The North of Scotland Hydro-Electric Board are now supplying electricity in the Sleat Peninsula of Skye as far south as Ostaig, having just completed an extension to their distribution system on the island. A supply is given to 50 homes and crofts, two churches and two farms. The new line which runs from Isleoronsay serves Knock, Teangue, Saasaig, Ferindonald, Kilmore and Ostaig.

Portishead

Plans are now well advanced for the construction of Portishead "B" generating station, in the South Western Division of the B.E.A. With an ultimate capacity of 360 MW, made up of six turbo-alternators, together with twelve boilers, the first unit is now expected to be operating in 1954—not by the end of 1952 as was originally envisaged. Three other sets will follow in the succeeding three years. The last two machines are not yet definitely in the plant programme. There will be two brick chimneys, each 380 ft high. The boilers will consume about 700,000 tons of coal a year, brought from South Wales by sea. A new 132 kV outdoor switching station will be erected nearby.

South Wales

During the period April 1 to November 30, 1950, 10,385 new consumers of all categories were connected to the South Wales Electricity Board's system. This compares with a figure of 10,436 for the similar period in 1949.

A new Grid point of supply at 132 kV has been put into operation near Crumlin. This new point of supply has been established to reinforce the present system and to cater for the increasing demands which have to be met in the eastern and western valleys of Monmouthshire.

LIGHTING SCHEMES

Alnwick.—The U.D.C.'s plan converting street lighting from gas to electricity has been approved with minor amendments.

Bradford.—T.C. has approved schemes for street lighting at Section "B" on Buttershaw housing estate, at a cost of £2,464; at Bierley housing estate, at a cost of £1,943; and converting lighting in Ferrand Avenue, at a cost of £306.

Carlisle.—T.C. has referred back for further consideration a plan to spend £1,500 installing fluorescent lighting in English Street.

Kelso.—The borough surveyor is preparing a plan for the erection of 110 lamps.

Malden (Surrey).—The Council is recommended to improve street lighting at Traps and Coombe Lane, New Malden, at a cost of £6,100.

Middlesbrough.—The T.C. is being recommended to include in its estimates for the next financial year £10,000 for improving lighting on 2½ miles of main traffic routes, and £12,350 for the provision of 306 lights on other roads. A further £4,000 is to be spent providing 100 lamps on private housing estates.

Ormskirk.—The Highways Committee is to urge the M. o. T. to approve a scheme for improved street lighting. In Stanley Street, Railway Road and Burscough Street, it is proposed to use sodium lamps instead of fluorescent.

Poplar.—The B.C. has been recommended to approve a scheme for improving lighting in streets in the Lansbury area, by the installation of 109 sodium lamps, at a cost of £2,500.

Stockport.—The General Purposes Committee has recommended the purchase of 200 electrical spring reserve clocks.

Swinton and Pendlebury.—T.C. applying for sanction to borrow £5,959 for providing lighting on the Manchester-Chorley Road A.6.

Torquay.—T.C. to ask the South-Western Electricity Board to prepare schemes for floodlighting at Corbyn Head, and an extension of the Rock Walk lighting.

Wakefield.—Approval of the M. o. T. is being sought to the installation of mercury vapour lighting in Warrengate, in place of the existing gas lighting.

Walsall.—T.C. to apply for consent to borrow £11,900 for improved lighting on various roads.

Company Activities

Andhra Valley Power Supply Co.

For the year to June 30 last, revenue amounted to Rs. 69,89,486, and the net profit was Rs. 25,61,432, less Preference dividend Rs. 1,72,690 and interim Ordinary dividend Rs. 30 per share. To contingencies reserve Rs. 2,56,500 (*nil*), special repairs reserve nil (*Rs. 36,015*), written off intangible assets Rs. 35,605 (*nil*), to general reserve Rs. 2,40,000 (*Rs. 3,02,605*), dividend reserve Rs. 13,30,000 (*Rs. 13,00,000*), leaving Rs. 23,252 carried forward.

Negretti and Zambra

Profit for the year to September 30 last, after allowing all charges, is £85,438 (*£79,607*); there is a final dividend of 15%, compared with 10% last year, making 19% (*14%*) for the year. Taxation absorbs £77,676 (*£80,041*), and there is £148,432 (*£93,856*) carried forward.

R. A. Lister & Co.

Preliminary statement shows a group profit for the year ended September 30 was £565,766, an increase of £63,614 on the previous twelve months. There is a final dividend of 6½%, making 9% (*11½%*).

Pernambuco Tramways and Power Co. Ltd.

For 1949, operating revenue amounted to £1,172,152, as compared with £931,516 in 1948. Operating expenses absorb £1,131,543 (*£963,743*), leaving a net revenue of £40,609 (*£32,227*), to which is added other income £5,049 (*£984*), making a total of £45,658 (*£31,243*). There is a balance of £44,321 (*loss £27,645*) before exchange adjustments, and the deficit carried forward is £435,919 (*£331,521*) after debiting £164,105 (*nil*), adjustment of property retirement provision.

Southern Brazil Electric

For 1949, the consolidated operating revenue amounted to £662,636, an increase of £137,015 on the total for 1948. Operating expenses, etc., absorbed £567,161 (*£417,306*), leaving a net operating revenue of £95,475 (*£108,315*), plus other income £802. After net interest and other deductions, the balance is £86,961 (*£94,426*), of which £3,036 is attributable to outside interests, and the balance (before exchange adjustments) carried to the consolidated deficit is £83,925. Dividends on the Preference shares are in arrears from July 1, 1926, and no provision has been made for undeclared dividends amounting to £429,580 at December 31, 1949. The company is transferring interests in three subsidiaries, and electric properties and other related assets.

Thorn Electrical Industries Ltd.

A meeting is to be held on February 2 to consider the issue, to which we referred last week. Purpose of the issue, state the directors, is to provide further working capital. As part of the plan shareholders are to be asked to increase the ordinary capital to £800,000 by creating 2,495,000 additional 5s. ordinary shares. After the distribution, unissued ordinary capital will total £271,250.

Dividends Declared

Electric Furnace Co. Dividend of 4½% (*3½%*).

Redfern's Rubber Works Ltd. Final Ordinary dividend 5% making 10% plus bonus 5% (*same*). Net profit for 1950, £32,339 (*£38,316*).

Commercial Information

CONTRACTS OPEN

HOME

Jan. 27.—Rochester. Lighting is included among street works required for Holcombe Road. City Surveyor, 66 Maidstone Rd., Rochester. Deposit £1 1s.

Jan. 30.—Wisbech (Isle of Ely) R.D.C. Wiring of 10 bungalows and 22 houses on various sites. S. G. Bailey, architect, Council Offices, Alexandra Road.

Jan. 31. — Baildon U.D.C. Supply and installation of 400 W mercury vapour lamps, lanterns and control gear, and concrete standards on Otley Road. Council's Surveyor, G. F. R. Dickinson, Town Hall, Baildon.

Jan. 31.—Newmarket R.D.C. Supply and erection of two vertical spindle centrifugal pumps driven by electric motors; also of a booster pump driven by an electric motor and controlled by automatic gear. Consulting Engineers, Silcock and Simpson, 10 Park Row, Leeds 1.

Feb. 1.—Birmingham. Renewal of electric lighting and power installation at King's Heath police station. H. J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham 1. Deposit £2 2s.

Feb. 1.—Lincoln. Electrical installation in proposed Technical College, Kingsway, Scunthorpe. County Architect, County Offices, Lincoln.

Feb. 2.—Belfast. Electricity Dept. invite supplies of various equipment and appliances including transformer kiosks, meters, l.t. fuse units, underground cable disconnecting boxes, washboilers, kettles and cooker boiling plates. Documents from the Dept., East Bridge St., Belfast. (See Jan. 11 issue.)

Feb. 2.—Bingley U.D.C. Installation of 400 W fluorescent mercury lighting units along about half mile of trunk road A650. Documents from F. M. Dunwell, Clerk of the Council, Town Hall.

Feb. 2.—Southern Elect. Board. Conversion, alteration or adjustment of wireless equipment on Wimpey estate in the Heston district due to change-over from 240/280 V d.c. to 240 V a.c. Documents from S. H. Fowles, district manager, 11 Staines Rd., Hounslow, Middx. (See Jan. 18 issue.)

Feb. 3.—Fareham U.D.C. Annual list of supplies for year ending March 31, 1952, includes electrical fittings. Engineer and Surveyor, Westbury Manor, Fareham.

Feb. 3.—Mitcham T.C. Supply of electric lamps required for twelve months from April 1, 1951. Borough Engineer and Surveyor, Town Hall.

Feb. 3.—Swinton and Pendlebury T.C. Wiring and supply of electrical fittings for 100 houses being built at Clifton estate. Borough Engineer and Surveyor, Town Hall, Swinton, Lancs. (See Jan. 18 issue.)

Feb. 5.—Luton. Installation of electrical services at Whipperley county primary infants' school at Farley Hill. Borough Engineer, Town Hall.

Feb. 5.—Staines U.D.C. Supply and erection of concrete columns and brackets, of lanterns and fittings, for mercury vapour street lighting installation in Kingston Rd. (A.308). Engineer and Surveyor, A. Hawley, 240 London Rd., Staines. Deposit £2 2s. (Advertised in this issue.)

Feb. 5.—Westminster. Supply of electric lamps, cable, etc., required for periods of 3, 6 or 12 months from April 1. Westminster City Hall, Charing Cross Rd., W.C.2.

Feb. 7.—Edinburgh T.C. Electrical work at the Music Hall, George St. City Architect, City Chambers, Edinburgh.

Feb. 7.—Gt. Yarmouth. Twelve months' supply of cables. Borough Engineer, Town Hall, Gt. Yarmouth. (Advertised this issue.)

Feb. 7.—Wrexham T.C. Columns and lanterns for group "B" street lighting. Details from J. M. Davies, Borough Engineer and Surveyor, 31 Chester St., Wrexham. (Advertised this issue.)

Feb. 8.—Derby T.C. Supply and installation of small goods lift at Central Market, Morledge. Borough Architect, Council House, Corporation St., Derby.

Feb. 8.—Metropolitan Water Board. Electric lamps are among list of annual requirements for 12 months beginning April 1. Chief Engineer, Offices of Board, New River Head, Rosebery Ave., E.C.1.

Feb. 10.—Banbridge R.D.C. Electric light installations in 12 houses at Lisnafiffy. D. W. Chambers, Architect, Town Hall, Deposit £2 2s.

Feb. 10.—Biggleswade U.D.C. Supply and erection of 43 concrete columns, lanterns, 140 W sodium discharge lamps, auxiliary equipment and wiring on trunk road. T. Wilson, Engineer and Surveyor, Church St. Deposit £2 2s. (See Jan. 11 issue.)

Feb. 10.—Leeds. Supply and delivery of 660 V cables of various sizes, paper insulated lead-covered single wire armoured, for Knostrop sewage works. Length required is 3,150 lineal yards. Junction boxes and telephone wires also required. Sewerage Engineer, Civic Hall, Leeds 1.

Feb. 10.—Leigh T.C. Complete installation of approx. three miles of street lighting, comprising high-pressure mercury vapour discharge lamps mounted on concrete columns. John Walmesley, Borough Engineer and Surveyor, Town Hall, Leigh, Lancs.

Feb. 12.—Lancaster. Supply of 8 No. street lighting lanterns and lamps for Skerton Bridge, on A.6. City Engineer, Town Hall. (Advertised in this issue.)

Feb. 12.—Salford T.C. Annual stores including electric cable, lamps and solder. City Engineer, Town Hall, Salford.

Feb. 14.—Prestwich T.C. (*a*) Supply, and (*b*) erection of 36 concrete lighting columns, (*c*) supply of 36 lanterns, (*d*) supply of 36 140 W sodium discharge lamps and control gear, and (*e*) installation of electrical equipment. Borough engineer, Town Hall, Prestwich. Deposit £2 2s. each.

Feb. 16.—Belfast. Supply and erection of mercury arc rectifier equipment. Electricity Dept., East Bridge St., Belfast. Deposit £2 2s. (Advertised in this issue.)

Feb. 17.—Cannock U.D.C. Electrical equipment is included in annual list of supplies for period

ending March 31, 1952. Edwin Lomax, Engineer and Surveyor, Council House, The Green.

Feb. 20.—Sligo C.C. Complete electrical installation in proposed conversion of the Girls' High School, Sligo, into a T.B. Hospital. Details from J. A. Kenny and Partners, consulting engineers, 44 Kildare St. Dublin. Deposit £15 15s.

Feb. 21.—High Wycombe T.C. Thirty-two concrete lighting columns, including lanterns for 250 W horizontal MV lamps, etc., for Hughenden Rd. Particulars from Borough Engineer's Dept., Municipal Offices, High Wycombe. Deposit £2 2s. (Advertised this issue.)

Feb. 26.—Worsborough U.D.C. Supply and erection of 84 street lighting columns with 140 W sodium discharge lamp lanterns, etc. Henry C. Hand, Clerk of the Council, Council Offices, Saville House, Worsborough Bridge. (See Jan. 18 issue.)

Feb. 26.—Manchester. Electrical installation at Charlestown Infants' School in Pilkington Road. City Architect, Town Hall. Deposit £1 1s.

Feb. 28.—Dewsbury T.C. Supply of electric lamps, cable 100-200 W lanterns with swan neck brackets, 300-500 W lanterns, c.i. steel and concrete lighting standards, paint, glass, uniform jackets, etc. Street Lighting Superintendent, 27 Battye St., Dewsbury. (Advertised this issue.)

Feb. 28.—Metropolitan Water Board. Manufacture and erection of 11,000 V and 415 V switchgear and motor control desks, and six transformers at Chingford South pumping station. Chief Engineer, Offices of the Board, New River-Head, Rosebury Ave., E.C.1. Deposit £1 1s. (See Jan. 18 issue.)

March 7.—Dublin. Two complete sets of rectifier equipment, having output of 1,000 A at 500 V. Also supply of one 400 kVA transformer for Port and Docks Board. Engineer's Office East Wall Rd., Dublin.

March 19.—North of Scotland H.E. Board. Forty miles of 132 kV steel tower o.h. line, between Beauly and Shin. Apply to Strain and Robertson, 154 West George St., Glasgow, C.2. Deposit £2 2s. (Advertised this issue.)

No Date stated. — Aberdeen. Electrical work in erection of assembly hall and gymnasium at Kairnhill junior secondary school. J. A. O. Allan, Ross and Allan, Architects, 10 Bon-Accord Square.

No date stated.—Ayrshire. Installation of new switchgear, main cables and sub-main wiring at Cuminghame Home, Irvine, for N. Ayrshire Hospitals. Applications to Jas. H. Ross, Consulting Engineer, 45 Hope St. Glasgow, C.2.

No date stated.—Dunbarton C.C. Electrical work in 10 houses at Auchentoshan and 12 at Milton. Apply to B. P. Gill, County Architect, Ferry Road, Old Kilpatrick, by Jan. 29.

No date stated.—Kirkcudbright C.C. Electrical installation in adaptation of Carlingwark House, Castle-Douglas, as a residence for old people. Apply to County Architect, County Offices, Kirkcudbright, by Feb. 3.

No date stated.—North Riding C.C. Alterations and additions to lighting installation at County Hall, Northallerton. Apply to County Architect, County Hall, Northallerton by Jan. 31.

No date stated.—Whitby R.D.C. Electric wiring work at the Spa Theatre. Surveyor, Council Offices.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Feb. 7.—Belgium. Belgian State Railways require 6,000 overvoltage fuses to specification for signalling and telecommunication installations. Direction du Materiel et des Achats, Bureau 26-51, 17 rue de Louvain, Bruxelles. B.o.T. (Ref: CRE (IB) 50852/51)*.

Feb. 10.—Persia. Ministry of Post Telegraph and Telephones, Tehran, are calling for tenders for one 4 kW transmitter with accessories. B.o.T. (Ref: CRE (IB) 50838/51)*.

March 15.—Brisbane. Manufacture, testing at works, delivery and maintenance for 12 months of 33 kV and 6·6 kV indoor switchgear with all auxiliary gear for William St. stores of City Electric Light Co. B.o.T. (Ref: CRE (IB) 51105/51)*.

May 16.—Queensland. Survey clearing of routes, supply and erection of h.v. and e.h.v. transmission lines, for State Electricity Commission. Agent-General for Queensland, 409-410 Strans, W.C.2. (Advertised in this issue.)

CONTRACTS PLACED

Castle Ward (Northumberland) R.D.C. Electrical installation in 94 houses at Hazlerigg. J. B. Wilson.

Luton T.C. Electrical installation in 73 houses on Farley Hill estate, Radio and Electrical Services Ltd., £2,486.

Swadlincote (Derby) U.D.C. Erection of 147 complete street lighting columns, G.E.C., Birmingham.

Your Queries — Answered

Neon indicating tubes, makers of? P.L.—Hivac Ltd., Greenhill Cres., Harrow; General Electric Co., Ltd., Magnet House, Kingsway, W.C.2; Acru Electric Tool Mfg. Co., Ltd., 123 Hyde Rd., Ardwick, Manchester. (19339)

"Micoxet" drills, agents for? E.M.—Micox Electrical Equipment Ltd., 307 Borough High St., S.E.1. (19344)

"Kenmore" vacuum cleaners, agents for? E.S.—Sears Roebuck and Co., Ltd., 9 Wembley Hill Rd., Wembley. (19351)

"Renscot" aluminium ware, makers of? E.B.—Arthur McFarlane and Co., Ltd., Hillington Industrial Estate, Earl Haigh Rd., Glasgow. (19356)

"Bestos" heaters, makers of? T.E.—Phethean Ltd., 409-411 Croydon Rd., Caterham, Surrey. (19359)

"Kopex" flexible metal conduit, makers of? W.W.—Uni-Tubes Ltd., Alpha St., Slough, Bucks. (19304)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE NOTES

Agents. — Barries Electrical Agencies, Ltd., King St., Brighton, have been appointed sole agents for Scotland for Reeves and Co., Ltd., Crescent Works, Birmingham.

Showrooms.—James Scott and Co. (Electrical Engineers), Ltd., opened their new showrooms in Sauchiehall St., Glasgow, last week.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Prestomat. 690,991. Class 7. Washing machines. Hoover, Ltd., Perivale, Greenford, Middlesex.

Veriglo. 692,143. Class 9. Electrically-operated signs. Robert Sieff, 15 Vallance Rd., N.22.

Velotrol. 692,468. Class 9. Electric current rectifiers. Hackbridge & Hewittic Electric Co., Ltd., Hersham Lodge, Hersham, Walton-on-Thames.

Fomoco (with design). 676,854. Class 11. Heating apparatus, air conditioning installations, fans, lamps and lamp reflectors. Ford Motor Coy., 3300, Schafer, Dearbon, Michigan.

Hivac (with design). 685,456. Class 11. Electric lamps. Hivac, Ltd., Greenhill Crescent, Harrow-on-the-Hill, Middlesex.

Firefly. 693,389. Class 11. Electric torches. H. Kirschenbaum, 85 Ryland Rd., Birmingham 15.

Isotape. 693,564. Class 11. Electrical installations for heating purposes. Isopad, Ltd., 13-17 Rosemont Rd., London N.W.3.

Cossor. B668,256. Class 9. Cathode ray tubes, television transmitting and receiving apparatus, electrical sound recording and reproducing apparatus, etc. A. C. Cossor, Ltd., Cossor House, Highbury Grove, London N.5.

Delanco. 693,801. Class 17. Insulating materials. Anglo-American Vulcanised Fibre Co., Ltd., Cayton Works, Bath St., London E.C.1.

Redfern. 664,344, and **Redfern's.** 664,345. Class 9. Chemical apparatus and electric accumulators and parts of such goods being made of rubber or of ebonite. Redfern's Rubber Works Ltd., Dawson St., Hyde, Ches.

E in design. B674,782. Class 9. Television and radio apparatus. E. K. Cole Ltd., Ekco Works, Priory Cres., Southend-on-Sea.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	202 0 0	£196 0 0
Delivered in 2nd and 3rd month after order ...	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	136 0 0	136 0 0
" " " "English" quality	137 10 0	—
Delivered in 2nd and 3rd month after order, plus	7 0 0	
TIN (99-99.75%) ... ...(Cash)	1240-1245	—
" (3 months)	1210-1215	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	151 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

Excelsior. 693,417. Class 9. Apparatus for measuring and automatically controlling the amount of material produced by machinery. Thomas Walker and Son, Ltd., 58 Oxford St., Birmingham 5.

Birloy. 675,318. Class 7. Conveyor belts and conveyors (machines) all for use on or in connection with heat-treatment furnaces, and parts. Birlec Ltd., Birlec Works, Tyburn Rd., Erdington, Birmingham.

Amal. 691,831. Class 9. Electrical and scientific measuring and checking (supervision) apparatus and instruments. Amal Ltd., Holford Works, Perry Barr, Birmingham.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Chappius Reflectors Ltd. Meeting of members will be held at 76 Finsbury Pavement, E.C.2, on Feb. 19 at 3 p.m. to receive an account from liquidator.

Partnership Dissolved

Scarborough. Stephen Henry Wright and Cleasby Hawkins Sizer, trading as electrical engineers at 5 Bar St. Debts dealt with by W. S. Marshall, of Ashby Marshall & Co., 36 St. Nicholas St., Scarborough.

BANKRUPTCY ACTS

Receiving Order

Dewsbury. Harry Sykes, electrical engineer of 22 Queen St., Morley. Date of order, Jan. 11.

First Meeting

Stockton-on-Tees. Jack Henderson, electrician, trading at 82 Calgate, Barnard Castle. First meeting at Official Receivers Office, 4 Bridge Rd., Stockton-on-Tees, on Jan 26 at 12 noon, and public examination at The Court House at same address on Feb. 20 at 11 a.m.

Dividend

Chelmsford. Barnett, Jacob and Barnett, Maurice, trading as Barnett Supplies Co., radio and electrical dealers and contractors, 102 and 104c Cranbrook Rd., Ilford. First and final dividend of 4¾d. in the £, payable on January 31, at 11-12 Finsbury Square, E.C.2.

Release of Trustee

Windsor. Jas. A. Farrington, trading as "The Radio Services" at 8 Upton Lea Parade, Wrexham Rd., Slough. Trustee: Leslie S. Findlay, Chartered Accountant, 4 Charterhouse Sq., E.C.1.

Voluntary Liquidation

Fluorescent Industrial Installations, Ltd., 3a, Ebury St., London, S.W.1. At a recent meeting of creditors a statement of affairs showed liabilities of £3,460, of which £2,700 was due to trade creditors and £760 to the bank. Assets at book value of £5,133 were estimated to realise £3,520. Deducting £619 for preferential claims, the net estimated realisable assets were £2,901, or a deficiency as regarded creditors of £559. It was stated that there was an action pending against the company in respect of an alleged breach of contract which was not admitted. Incorporated in March, 1946, with a nominal capital of £1,000 of which £780 had been issued, the firm made a net profit for the year to August 31, 1948, of £1,147, but in the following year a net loss of £1,024 was incurred. For the year ended August 31, 1950, there was a net profit of £1,143, and for the three months to November 30 last a net loss of £898. A resolution was passed confirming the voluntary liquidation with Mr. F. F. Weston, 21 Panton St., Haymarket, S.W.1 as liquidator, with a committee of inspection.

BUSINESS PROSPECTS

HOME

Aberdeen. Expenditure of £176,000 approved for restoration of part of Holburn St. school, reconstruction of Hanover St. school and extensions to Inverdee infants' school.

Abingdon R.D.C. Tenders likely to be invited for erection of 32 houses at Drayton.

Banstead U.D.C. Block of flats and 68 houses are to be built on Chipstead Rd. estate. A. W. Kenyon, Architect, 15 Adeline Place, Bedford Square, W.C.1.

Barnstaple T.C. Plans approved for erection of 20 flats on Pilton Lawn estate. Also for shops and flats on Forches estate.

Beeston and Stapleford U.D.C. Erection of 28 cottage flats in seven blocks on Ryecroft estate. G. C. Hardy, Surveyor, Town Hall, Beeston, Notts.

Blackpool T.C. Erection of 18 houses and 4 flats on Mereside estate. Borough Surveyor, Arthur Hamilton, Municipal Buildings.

Bridge-Blean (Kent) R.D.C. Erection of 24 houses at Bekesbourne, near Canterbury. Building Surveyor, Council Offices, Old Dover Rd., Canterbury.

Bristol. Erection of clinic in Claremont St. at estimated cost of £24,000.

Brownhills U.D.C. Erection of 52 houses, 8 flats and 4 shops on Bridge Rd., Sheffield, site. Jennings, Homer and Lynch, 3/5 Church St., Brierley Hill, Staffs.

Burnley. Plans approved for erection of Heasandford county technical school. Estimated cost £150,000.

Carlisle. Tenders shortly to be invited for installation of electricity in 42 houses. City Engineer, 18 Fisher St.

Cardigan T.C. Tenders likely to be invited for erection of 22 houses on the Ridgeway site.

Chailey R.D.C. Erection of 10 bungalows and block of flats at Ditchling. Council's Architect, Council Offices, Lewes Hse., High St., Lewes.

Cleethorpes T.C. Erection of 22 houses on Highgate site. A. B. Cooper, Borough Engineer, Council House.

Cornwall. Erection of health clinic at Bodriggy, Hayle. Sydney Gregson, County Architect, County Hall, Truro.

Crewe T.C. Application to be made for permission to build 76 dwellings on Middlewich St. estate.

Daventry (Northants) R.D.C. It is proposed to erect 22 houses at Weedon, 20 at Byfield, 10 at Staverton and 4 at Kilsby.

Dorking R.D.C. It is proposed to build 48 houses at Horley and Lowfield Heath, and 36 on various other sites.

Dublin T.C. Erection of 206 houses at Philipsburgh Avenue estate, and 184 at Finglas West housing area. Housing Architect, 6 Mountjoy Sq., Dublin.

East Riding. Construction of Hedon/Preston county secondary school. Johnson and Crabtree, Architects, 20 Priory Place, Doncaster.

Edinburgh. Dean of Guild Court has approved plans for erection of television relay station at Blackford Hill.

Elgin (Moray). T.C. seeking approval to build 200 houses near Deanshaugh Rd. Seafield Lands.

Garstang (Lancs.). R.D.C. proposes to erect 30 houses on Kepple Lane site and 10 on Smallwood Hey site at Pilling.

Golborne (Lancs.) U.D.C. Plans approved for erection of 100 houses.

Haydock U.D.C. Erection of 32 houses and 12 bungalows on Church Rd. site. Surveyor to Council, R. Main, Council Offices.

Heywood T.C. Erection of 48 houses on Gooden Farm estate or in Sussex Ave., and 4 maisonettes at Heap Bridge.

Hoole U.D.C. Construction of 24 houses on the Linden Grove and Hoole House estates. Council's Architect, Robert Boot, 22 Newgate St., Chester.

Leeds. Council to invite tenders for erection of 48 flats on Moortown estate, 60 on Seacroft estate, 84 dwellings on Tinshill estate, and 170 dwellings at Belle Isle.

London. Westminster Diocesan Schools Assoc. proposes to build secondary modern school in Maida Vale at cost of £134,640.

Luton T.C. It is proposed to build a college for further education. Architects are Norman and Dawbarn, 5 Gower St., W.C.2.

March (Isle of Ely) U.D.C. Tenders to be re-invited for erection of 42 houses at Peashill estate.

Newcastle-on-Tyne. Council is arranging for the erection of 800 houses on various sites. City Architect is G. Kenyon, 18 Cloth Market, Newcastle.

Newport (Mon.) T.C. Erection of 133 houses proposed on St. Julian's (South) site at cost of £185,259.

Northampton. Construction of 39 houses in Harborough Rd. Borough Architect, Guildhall.

Peterborough. Council proposes to erect 198 houses on Eastfield estate, 48 at Mountsteven Av., and 28 at Dogsthorpe North.

Plymouth T.C. Erection of proposed primary school at Johnston Terrace. Architects, Louis de Soissons and Partners, 5 Portland St., Plymouth.

Plymouth. The Plymouth, S. Devon and E. Cornwall General Hospital Group is compiling a list of contractors for numerous works including electrical services, and tenders are invited from firms willing to undertake such works. Applications to be placed on the list should be sent to C. R. Tozer, Maintenance Officer, Plymouth Hospitals, 7 Nelson Gdns., Stoke, Plymouth.

Ross-on-Wye U.D.C. Application made for sanction to borrow £30,000 for erection of town hall.

Staveley U.D.C. Construction of 22 houses on Inkersall Green estate. Engineer and Surveyor, H. Cott, Council Offices, Lowgates, Staveley.

Stockport T.C. Erection of 98 houses and flats on Brinnington estate. Wm. F. Gardner, Borough Surveyor, Town Hall.

Wigan T.C. Application to be made to borrow £202,500 for erection of secondary technical school in Parsons Walk, and £255,000 for St. Thomas More secondary school.

Wigston (Leics.) U.D.C. Installation of electricity in 140 houses has been approved. Estimated cost £2,800.

OVERSEAS

Belgian Congo. Galeries Stanleyvilloises, B.P.387, Stanleyville, would like to receive offers for supplies of electric cookers. They will also consider representation on a sole agency basis.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Amalgamated Refrigeration Co., Ltd., 58 Theobalds Rd. W.C.1. Cap.: £10,000. Dirs.: D. Wilson and M. Barber.

Cradley Transformers Ltd., Endurance Works, Newtown Lane, Cradley Heath, Staffs. Manufacturers of and dealers in electric, motor, mechanical and non-mechanical vehicles, etc. Cap.: £5,000. Dirs.: A. J. Crawley and W. A. Billingham.

Fluorescent Patents Ltd., 50/52 Hoe St., E.17. Merchants of and dealers in discharge lighting fittings, etc. Capl. £200. Dirs.: R. L. Dries and L. F. Dries.

G-F Rentals Ltd., Audrey Hse., Ely Place, Holborn, E.C.1. Manufacturers of and dealers in wireless and television receiving sets, etc. Cap.: £6,000. Dirs.: Dr. J. Grant, H. G. Frere and Mabel Frere.

Geo. Watson (Electrical) Ltd., 811 Green Lanes, N.21. Cap.: £5,000. Dirs.: E. G. Watson and Mrs. E. G. Watson.

Graham's Radio & Electrical Service (Willesden) Ltd., 244/8 Abbey Hse., Victoria St., S.W.1. Nom. Cap. £2,500. Dirs.: Mrs. N. Gershuny, S. J. Gershuny and C. A. Gershuny.

Gulf Radiators Ltd. Manufacturers of and dealers in radiators, baths, etc. Cap.: £50,000. Dirs.: to be appointed by subs. Subs.: B. L. B. Hutchings and F. Williamson (solicitors), 5 Thavies Inn, E.C.1.

G. K. Lancaster (London) Ltd., 50 George St., Croydon, Surrey. Designers and manufacturers of and dealers in electrical welding, soldering and brazing equipment and components therefor, etc. Cap.: £1,500. Dirs.: G. K. Lancaster and Mrs. J. L. A. Lancaster.

Pier Electrical (Brighton) Ltd., 20 Madeira Place, Brighton 1. Automobile, electrical, general electrical, radio, television and mechanical engineers, etc. Cap.: £500. Dirs.: A. T. M. Young and S. E. Poulter.

Refrigeration Development Co. Ltd., 22 The Green, Edmonton, N.9. Cap.: £100. Dirs.: H. A. West and E. G. Frost.

Servispeed Ltd., Dudbridge, Stroud, Glos. Manufacturers of and dealers in refrigerators, etc. Cap.: £3,000. Dirs.: I. F. Eyles and R. W. Taylor.

Stella Radio and Television Co., Ltd., Century Hse., Shaftesbury Av., W.C.2. Cap.: £1,000. Dirs.: W. R. Tucker, E. W. Brades and R. J. Stevens.

Walker and Hutton Ltd., 14 Bar St., Scarborough. To take over business of electrical and mechanical engineers carried on as "Walker and Hutton" at Scarborough. Cap.: £2,500. Dirs.: C. Hawson and Mrs. E. Hawson.

Winnards, Ltd., 77a Back Station Rd., Blackpool, S.S. Electrical and mechanical engineering designers, etc. Cap.: £5,000. Dirs.: S. H. Winnard, J. Weightman, E. M. Winnard and Mrs. L. Weightman.

Wholesale Electro (Bradford) Ltd. In regard to our note of this concern last week, we are asked to make it clear that the address we gave is that of Mr. A. Buckley, a director. Mr. H. Beevers's address is 23 Rufford Drive, Yeadon.

MEETINGS TO NOTE

THURSDAY, JAN. 25

A.S.E.E. (Luton Branch). — "Light, Vision and Lighting." B. H. Gurr. George Hotel, George St., 8 p.m.

I.E.S. (Nottingham Centre).—"Textile Lighting." T. S. Jones. Gas Showrooms, Parliament St., 5.30 p.m.

I.E.S. (Bradford Group).—"Light, Colour and the Stage." E. Faraday. Yorks Elect. Board, Sunbridge Rd., 7.30 p.m.

SATURDAY, JAN. 27

I.E.E. (N. Midland Centre).—Discussion "The M.K.S. System." College of Technology, Cookridge St., Leeds 2, 10 a.m.

MONDAY, JAN. 29

I.E.E. (London Measurements Section).—Sectional dinner at Cafe Royal, 6.30 p.m.

I.E.E. (S. Midland Centre).—"Operation and Maintenance of Television Outside Broadcast Equipment." T. H. Bridgewater. James Watt Memorial Inst., Gt. Charles St., Birmingham, 6 p.m. (Joint meeting with Radio Group.)

E.A.W.—"Electricity and the French Woman." Mrs. M. L. Pearce. I.E.E., Savoy Place, W.C.2, 6 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Deterioration of Mains Cable due to External Causes." P. W. Cave. Old Academy, Bridge St., Warrington, 7 p.m.

TUESDAY, JAN. 30

I.E.E. (London Measurements and Radio Sections).—Symposium of papers on "Electrical Meteorological Instruments." Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.W. Utilization Group). —"Electrically interlocked Guards on Machines." W. Fordham Cooper. Engineers' Club, Albert Sq., Manchester. 6.15 p.m.

WEDNESDAY, JAN. 31

I.E.S. (Swansea Group).—Presidential address. L. J. Davies. 4 Northampton Gardens, Swansea, 5.45 p.m.

THURSDAY, FEB. 1

I.E.S. (Cardiff Centre).—Presidential address, L. J. Davies. S. Wales Elect. Board, The Hayes, Cardiff, 5.45 p.m.

I.E.S. (Exeter Group).—"Shop Window Lighting." T. S. Jones. Agricultural Hse., Queen St., 7 p.m.

ELECT. POWER ENGR'S ASSOC. (Midland Tech. Group).—"Television." I. N. Vaughan Jones. Walsall, 7 p.m.

I.E.E. (London).—"Standardisation and Simplification in Electrical Industry." J. T. Moore. "Organisation for Internal Standardisation in a Large Manufacturing Co." P. J. Daglish. Savoy Place, W.C.2., 5.30 p.m.

I.E.E. (Rugby sub-centre).—Engineers Ball at Co-operative Hall, Rugby, 8 p.m.

INCORP. PLANT ENGRS. (Peterborough Branch).—Address by A. L. Berridge, manager of Peterborough power station. Eastern Gas Board, Church St., 7.30 p.m.

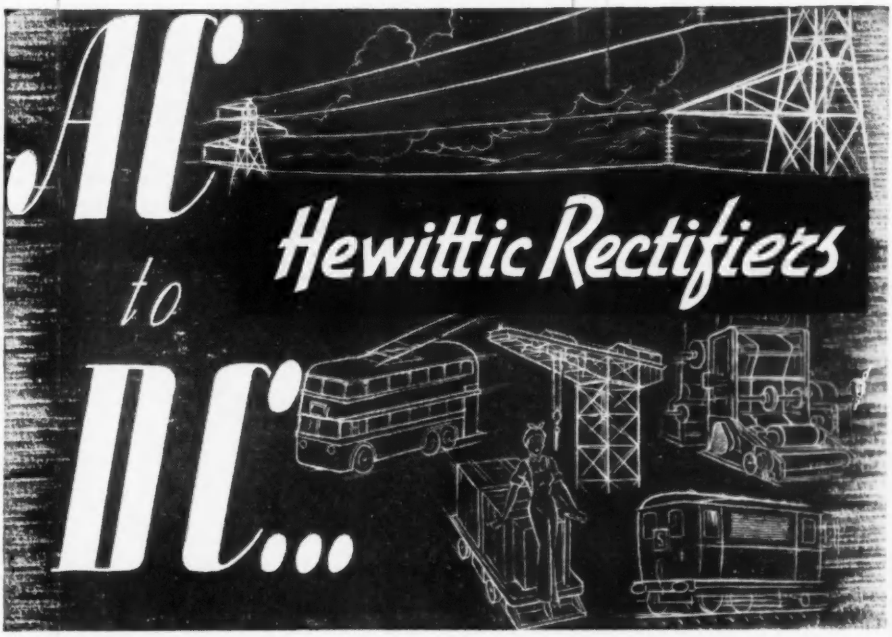
FRIDAY, FEB. 2

I.E.S. (Bath and Bristol Centre).—"Shop Window Lighting." T. S. Jones. Grand Hotel, Bristol, 7 p.m.

I.E.S. (Huddersfield Group).—"Fringe Area Television," with demonstration. J. T. Thornton.

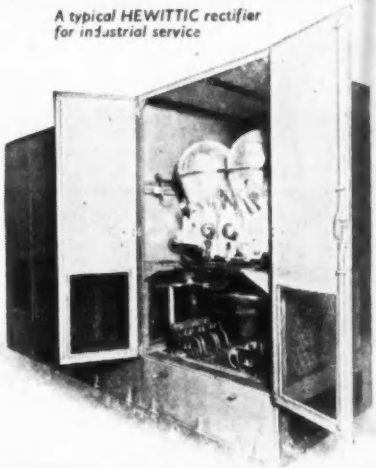
I.E.E. (S. Midland Centre).—Jubilee dinner at Grand Hotel, Birmingham, 6.30 p.m.

MANCHESTER ASSOC. OF ENGRS.—"Planning for Production Efficiency." Sir Claude D. Gibb. Engineers' Club, Albert Sq., Manchester, 6.45 p.m.



THE problem of providing a D.C. supply for the operation of electric traction systems, electric trucks, cranes and hoists, steel mill and other D.C. industrial drives, electrolytic plant, lifting magnets, magnetic clutches and magnetic separators; for small-scale or bulk charging of batteries for electric vehicles, miners' lamps, etc.—for almost every application where D.C. is required—is most effectively solved by installation of a HEWITTIC rectifier, the simplest, most reliable converting plant made.

A typical HEWITTIC rectifier for industrial service



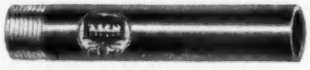
Flexible in layout to suit existing buildings and awkward sites, economical in space, highly efficient at all loads (therefore low in running costs) requiring negligible maintenance, OPERATING UNATTENDED even with the largest installations, a HEWITTIC Rectifier is the perfect link between A.C. supply and D.C. application.

OVER A MILLION KW. IN WORLD-WIDE SERVICE

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

"It's no trouble at all!"



Screwed & Socketed Gas Thread

Screwed & Socketed Conduit Thread

Light Gauge Tube

How often one hears that remark but how *true* it is when you are working with Metallic Conduit Tube and Fittings. For quality and consistent accuracy—

SPECIFY METALLIC

CONDUIT TUBE & FITTINGS

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THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167
Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

132 kV STEEL TOWER TRANSMISSION LINE

TENDERS are invited for the supply, delivery and erection of a 132 kV Steel Tower Overhead Line, approximately 40 miles route length, between Beauly (County of Inverness) and Shin (Sutherland).

Copies of the tender document may be obtained on or before February 7, 1951, on application to the Engineers, Messrs. Strain and Robertson, 154 West George Street, Glasgow C.2. Applications should be accompanied by a cheque for £2 2s. 0d. which will be returned on receipt of a bona fide tender.

Tenders, in duplicate, enclosed in a sealed cover and endorsed on the left hand corner "Contract C/62/BSH/1," must reach the subscriber not later than Monday, March 19, 1951.

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3.
January 18, 1951. (H 467)

STATE ELECTRICITY COMMISSION OF QUEENSLAND AUSTRALIA

TENDERS are invited on behalf of various Regional Electricity Boards for the following :—

SPECIFICATION NO. 257.—SURVEY, CLEARING OF ROUTES, SUPPLY AND ERECTION OF HIGH VOLTAGE AND EXTRA HIGH VOLTAGE TRANSMISSION LINES

Specification, tender forms and full details are available for inspection at the Offices of

(a) The Agent General for Queensland, 409/410 Strand, London W.C.2.

(b) Commercial Relations and Exports Department, Industries Branch, Board of Trade, Thames House North, Millbank, London S.W.1.

Copies for tendering purposes may be obtained from the State Electricity Commission of Queensland, Eagle Street, Brisbane, upon payment of £3 3s. for the first copy and £1 1s. for each additional copy. The cost of the first copy will be refunded upon receipt of a bona fide tender.

Sealed tenders, which must be endorsed as specified, will be received at the office of the State Electricity Commission of Queensland, Brisbane, up to May 16, 1951.

The lowest or any tender not necessarily accepted.

R. W. PICKING,
Acting Secretary.
(H 449)

BOROUGH OF HIGH WYCOMBE

STREET LIGHTING HUGHENDEN ROAD A.4128

TENDERS are invited for supplying and erecting 32 No. CONCRETE LIGHTING COLUMNS including lanterns suitable for 250 watt horizontal burning mercury vapour lamps including all necessary chokes, fuses, baseboards, etc., and wiring complete.

Specification, bill of quantities and form of tender may be obtained from the Borough Engineer's Department, Municipal Offices, High Wycombe, on receipt of a cheque for £2 2s. which will be returned on submission of a bona-fide tender.

Tenders in a sealed envelope which shall bear no name or mark indicating the sender, but endorsed "Tender—Street Lighting Hughenden Road", must be delivered to the undersigned not later than noon on Wednesday, February 21, 1951.

The Council do not bind themselves to accept the lowest or any tender.

J. A. PARKINSON, M.A., A.M.I.C.E.,
Borough Engineer and Surveyor.
Municipal Offices, High Wycombe. (H 459)

COUNTY BOROUGH OF BELFAST

MERCURY ARC RECTIFIER EQUIPMENT

TENDERS are invited for the supply, delivery, and erection of Mercury Arc Rectifier Equipment.

Form of tender and specification (No. G.157) may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a deposit of two guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable.

Each tender, in sealed envelope marked "Tender for Mercury Arc Rectifier Equipment, Electricity Department" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, February 16, 1951.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
January 17, 1951. (H 435)

CITY OF LANCASTER

SUPPLY OF STREET LIGHTING LANTERNS

TENDERS are invited for the supply of eight No. Street Lighting Lanterns, complete with lamps, etc., for the lighting of Skerton Bridge, Trunk Road A.6.

Plans showing the positions of the columns and a specification may be obtained from the City Engineer, Town Hall, Lancaster.

Tenders to be delivered to the undersigned in a plain sealed envelope endorsed "Tenders for Street Lighting Lanterns" not later than 10 a.m. on Monday, February 12, 1951.

R. M. MIDDLETON,
Town Clerk.

Town Hall,
Lancaster.
January 17, 1951. (H 434)

BOROUGH OF WREXHAM

GROUP "B" STREET LIGHTING

TENDERS are invited for the supply of STANDARD COLUMNS and LANTERNS for Group "B" Street Lighting. Specification, quantities and form of tender may be obtained from Mr. J. M. Davies, M.I. Mun.E., Borough Engineer and Surveyor, 31 Chester Street, Wrexham.

Tenders should be returned to the undersigned in sealed envelopes, endorsed "Group 'B' Lighting," not later than Wednesday, February 7, 1951.

PHILIP J. WALTERS,
Town Clerk.

Guildhall, Wrexham.
January 18, 1951. (H 460)

COUNTY BOROUGH OF GREAT YARMOUTH

CONTRACT FOR ELECTRIC CABLES

THE Council are prepared to receive tenders for the supply of electric cables for a period of one year from April 1, 1951. Specification, form of tender and conditions of contract may be obtained from the Borough Engineer, Town Hall, Great Yarmouth. Tenders upon the form supplied, in plain, sealed envelopes endorsed "Tender for Cables" must be delivered to me not later than Wednesday, February 7, 1951.

The Council do not bind themselves to accept the lowest or any tender.

FARRA CONWAY,
Town Clerk.

Town Hall, Great Yarmouth.
January 18, 1951. (H 451)

STAINES URBAN DISTRICT COUNCIL

STREET LIGHTING

THE Council invites tenders for a mercury vapour street lighting installation to Group A standard in Kingston Road (A 308), Staines, as under:

(a) Supply of reinforced concrete columns and brackets, together with the erection of columns, brackets, lanterns, wiring of columns and lanterns and gear.
(b) Supply of lanterns and fittings.

Plans and conditions of contract may be seen at, and form of tender, specification and bills of quantities, can be obtained from the office of the Engineer and Surveyor, Mr. A. Hawley, F.R.I.C.S., 240 London Road, Staines, on payment of two guineas deposit which will be refunded on receipt of a bona fide tender and return of all documents.

Tenders in plain sealed envelopes endorsed "Street Lighting—Kingston Road," must be delivered to me not later than midday on February 5, 1951.

The Council does not bind itself to accept the lowest or any tender.

F. ENTWISTLE,
Clerk of the Council.

Clarence Street, Staines.
January, 1951. (H 403)

COUNTY BOROUGH OF DEWSBURY

Street Lighting Department

TENDERS are invited by the above Corporation for the supply of:—

BIJOU AND NO. 2 MANTLES
ELECTRIC LAMPS
ELECTRIC CABLE
100-200 WATT LANTERNS WITH SWAN-NECK BRACKETS
300-500 WATT LANTERNS
GAS LANTERNS
CAST-IRON, STEEL, AND CONCRETE LIGHTING STANDARDS
PAINT
GLASS
UNIFORM JACKETS

Form of tender, schedule and general conditions, and any further information required can be obtained from the Street Lighting Superintendent, 27 Battye Street, Dewsbury, Yorks.

Tenders, enclosed in a plain sealed envelope, endorsed "Tender for Electric Lamps" or any of the other specified materials, must be sent to me by noon on Wednesday, February 28, 1951.

A. NORMAN JAMES,
Town Clerk.

Town Hall, Dewsbury, Yorks.
January 18, 1951 (H 452)

APPOINTMENTS VACANT

UNIVERSITY OF LIVERPOOL

APPLICATIONS are invited for the post of ASSISTANT LECTURER in the Department of Electrical Engineering (Electro-Technics), at an initial salary of £450 per annum, with allowance for age and qualifications. Experience in the generation, transmission and distribution of electrical energy, design of electrical machinery, electric traction and advanced electrical technology would be advantageous.

Applications, stating age, academic qualifications and experience, together with the names of three referees, should be received not later than February 24, 1951, by the undersigned, from whom further particulars of the conditions of appointment may be obtained.

STANLEY DUMBELL,
Registrar.

January, 1951. (H 370)

NATIONAL COAL BOARD

APPLICATIONS are invited for the post of CHIEF ELECTRICAL ENGINEER (Mining) under the Chief Mechanical and Electrical Engineer in the Production Department at London Headquarters.

Applicants should have had practical experience in the use of electricity in mines and should have a comprehensive knowledge of the application of electricity to all phases of mining engineering, both on the surface and underground. They should also be familiar with the regulations governing the use of electricity in mines and with the essential features of the design of flameproof enclosures. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Salary £1,500 to £2,250 per annum, according to qualifications and experience. The post is superannuable.

Apply, in writing, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London S.W.1, marking envelope TT/287. Original testimonials should not be forwarded. Closing date, February 12, 1951. (H 407)

SOUTHERN ELECTRICITY BOARD

No. 2 Newbury Sub-Area

AGRICULTURAL REPRESENTATIVE, OXFORD DISTRICT

APPLICATIONS are invited for the above post. Candidates should have a sound knowledge of the application of electricity in agriculture and horticulture. They must be capable of conducting negotiations, and ability to give talks to agricultural organisations will be an advantage.

The salary will be in accordance with Grade 3 of the N.J.C. permanent salary agreement (£450 to £510) per annum, with N.J.C. Conditions of Service. The successful candidate will, if eligible, be required to join the B.E.A. and Area Boards' Superannuation Scheme.

Applications should be made on a standard form obtainable from the Sub-Area Secretary and returned to him at 7 Oxford Road, Newbury, within ten days of the appearance of this advertisement.

F. W. KEMPTON,
Secretary.
(H 448)

SINGAPORE MUNICIPALITY

Electricity Department

CHARGE ENGINEERS, Permanent Staff, required for shift duties in the Singapore power station. Present capacity 37,000 kW with proposed extensions to 87,000 kW.

Experience of extra high tension 3-phase generation in a modern high pressure steam power station required. Appointment subject to medical examination.

Basic salary scale $440 to $870 per month. Starting point according to qualifications and experience. Graduated scale of allowances, e.g. present allowances on $590 p.m. basic salary amount to: expatriation $110 p.m. plus cost of living $193 p.m. for single man or $256.50 p.m. for married man or $334.50 p.m. for married man with family. One Straits dollar equals 2s. 4d. Thus a married man with family on basic salary of $590 would draw equivalent of £1,448 sterling per annum.

Quarters with heavy furniture provided at 8 per cent. of salary or housing allowance in lieu. Initial engagement on three years' agreement. Eight months leave after four years service. Free medical attention. Passages paid including family (children under 17). Compulsory provident fund contribution 7½ per cent. of salary and municipal commissioners donate 7½ per cent. for first 10 years rising to 20 per cent. after 20 years' service.

Applications, in duplicate, with full personal and technical information and copies of three testimonials to Messrs. Peirce and Williams (Agents to the Municipal Commissioners), 1 Victoria Street, London S.W.1.
(H 430)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER (Measurement)
(Vacancy No. 73/50)

Applicants should be Corporate Members or Graduates of the Institution of Electrical Engineers or possess equivalent qualifications, and should have a sound knowledge of automatic protective gear with some experience in the commissioning and maintenance of equipment. Experience of high voltage testing and high voltage cable fault location will be an advantage. The successful candidate will be required to undertake standby duties for high voltage fault location. Salary, N.J.B. Schedule, Class "K," Grade 10, £646 £674 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope near Leeds, within fourteen days of the appearance of this advertisement.

No. 5 (Wakefield) Sub-Area

SECOND ASSISTANT ENGINEER (Construction)
(Vacancy No. 93/50)

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They must have wide experience in the supervision of equipment of 11 kV and 33 kV substations, the construction of 11 kV and 33 kV overhead lines and underground cables either by direct labour or by contract.

Salary, N.J.B. Schedule, Class "J," Grade 7, £736 £770 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, within fourteen days of the appearance of this advertisement. (H 393)

CHINA LIGHT & POWER CO., LTD.

Kowloon, Hongkong

ASSISTANT ENGINEER—DISTRIBUTION DEPARTMENT

APPLICATIONS are invited for the above position from suitably qualified engineers, preferably aged 30 to 35 years.

Applicants must have sound theoretical training and practical experience in the installation and maintenance of high and low voltage underground and overhead mains, static sub-station plant and distribution equipment.

The company operates only in the Crown Colony of Hongkong, using modern British equipment, and the position offered is progressive for a capable and experienced man.

Commencing salary HK$1,025 per month, rising by annual increments of HK$25 to HK$1,450, with high cost of living allowance which varies in accordance with the local government index figure, the present allowance being HK$881 for married men, HK$518 for single men, in addition there is an allowance of HK$100 for the first child and HK$90 for the second. The average value of the Hongkong dollar is 1s. 2 13/16d.

A provident scheme is in operation and also a retiring fund, qualification for the latter being 20 years' service and age 55.

First class unfurnished quarters are provided or alternative accommodation, also free passage (P. and O. 2nd class) out and return passage after completion of contract. Successful applicants will be required to pass a medical examination.

Apply, giving full particulars and when available, to Box E.T. 802, L.P.E., 110 St. Martin's Lane, W.C.2. (H 431)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of SECTION ENGINEER in the Warrington Section. Salary £684 to £815 per annum, Class "AX," Grade 4, of the N.J.B. Agreement.

Applicants should possess recognised degrees in electrical engineering or equivalent qualifications, and must have had sound experience in h.v. transmission.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme and may be subject to a medical examination.

Forms of application may be obtained from the Divisional Secretary, Clarke Gardens, Woolton, Liverpool, and should be returned to him not later than Friday, February 9, 1951.

A. R. COOPER,
Divisional Controller.
(H 446)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

VACANCIES occur at their Staff Training College, Pitlochry, for JUNIOR ENGINEER TRAINEES for the course beginning in March, 1951. All trainees are expected to spend some time on power-station operation, and some may subsequently be transferred to distribution.

Applicants should hold a degree, diploma, or Higher National Certificate in electrical engineering, or in one or two cases mechanical engineering, and preferably have completed an approved works' training. There will be a medical examination before entry.

Pay during training will be at the rate of £300 per annum, and the duration of the training period will be 9-12 months. National Joint Board conditions are applicable to the Board's Junior Engineers.

A charge will be made for board and lodging during residence at the Staff College.

Preference will be given to qualified applicants associated with the Board's area.

Application forms, which can be obtained from the Bursar, Staff College, Faskally House, Pitlochry, should be completed and returned to the Bursar within 14 days from the publication of this notice. (H 406)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

APPOINTMENT OF SUB-AREA MANAGER

DUE to the impending retirement of Mr. J. H. Lumsden, the present holder of the office, the Board invite applications for the appointment of Sub-Area Manager of the No. 7 Sub-Area at Hazel Grove, near Stockport, at a salary within the range of £2,000 by £50 to £2,250 per annum, which is provisional and subject to negotiation with the appropriate body.

Candidates should have extensive experience in the administration and control of an electricity undertaking.

Applications, on forms to be obtained from the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, should be received by him duly completed not later than Saturday, February 10, 1951. (H 429)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT SECTION ENGINEERS

APPLICATIONS are invited for positions as Assistant Section Engineers in the Transmission Department within the East Midlands Division.

Applicants should have received a first class technical education and should be Corporate or Graduate Members of the I.E.E., and must have had experience in the maintenance and operation of high voltage overhead lines and outdoor transformer and switching stations. Experience of 132 kV equipment would be an advantage.

Commencing salary will be in accordance with Grade 6, Schedule "C" of the N.J.B. Agreement (£516 to £707 per annum), and will commence at a point commensurate with qualifications and experience. The post will be superannuable within the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be made on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, and should be returned to him not later than February 12, 1951.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate,
Nottingham. (H 445)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

PURCHASING ASSISTANT

APPLICATIONS are invited for the position of Assistant in the Purchasing Department at Area Headquarters, Edinburgh.

Applicants should have experience in the purchase of engineering and commercial electrical equipment, stores organisation and stock control procedure.

The post will be graded at Grade 7 of the N.J.C. Scales (£705 to £795). Placing on the Scale will be according to experience and qualifications. The successful candidate will require to contribute to a superannuation scheme and may have to undergo a medical examination.

Applications, in writing, stating age and giving full details of education, qualifications, training and experience, should be received by the Secretary, South East Scotland Electricity Board, 52 Melville Street, Edinburgh 3, within 14 days of the publication of this notice. (H 443)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Drawing Office of the Chief Generation Engineer (Construction) at Wolverhampton:—

(a) MECHANICAL DRAUGHTSMAN

Candidates should have a wide experience in (a) the layout and design of generating stations, or (b) generating plant, including boilers, turbo-alternators and ancillary equipment.

The provisional salary will be in the range of £500 to £600 per annum.

(b) ELECTRICAL DRAUGHTSMAN

Candidates should have a knowledge of the layout of generating stations, works switchgear and works systems.

The provisional salary will be in the range of £375 to £475 per annum.

(c) CIVIL ENGINEERING DRAUGHTSMEN

(i) Candidates should have experience in the design of civil engineering and building works for generating stations, and reinforced concrete work.

The provisional salary will be in the range of £375 to £475 per annum.

(ii) Candidates should have had a wide experience in the layout and design of heavy structural steelwork for generating stations.

The provisional salary will be in the range £500 to £600 per annum.

(d) ARCHITECTURAL AND BUILDING DRAUGHTSMEN

Candidates should possess wide experience in the preparation of working drawings relating to power stations and other buildings.

The provisional salary will be in the range of £500 to £600 per annum.

The salary ranges quoted are provisional and subject to negotiation with the appropriate organisation. The possession of an engineering degree or recognised qualification will be considered an advantage. Conditions of service and superannuation will be as approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham, 13, and should be returned not later than February 3, 1951.

F. W. LAWTON,
Divisional Controller.
(H 376)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters Chief Engineer's Department

SENIOR ASSISTANT ENGINEER (CIVIL) DISTRIBUTION DESIGN (SUBSTATIONS) SECTION (VACANCY NO. 9/51)

Applicants should possess a degree in engineering or equivalent qualification, be Corporate Members of the Institution of Civil Engineers, or the Institution of Structural Engineers, and have experience of quantity surveying, and procedure in connection with contracts and the various regulations governing civil works.

The person appointed will be responsible to the Distribution Design (Substations) Engineer for the civil engineering work associated with the construction of high voltage substations and other building projects. Duties will include preliminary investigation of sites, preparation of specifications and designs for foundations, reinforced concrete and steel structures, examination of tenders, preparation of reports making recommendations for placing contracts, co-ordination of site works, and generally acting in an advisory capacity in civil engineering matters. Salary N.J.B. Schedule "C", Grade 1, £884 £1,015 rising to £1,108 per annum in Class "DX."

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, present salary and employment, should be addressed to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, within fourteen days of the appearance of this advertisement.

No. 5 (Wakefield) Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (BARNSLEY) (VACANCY No. 8/51)

Applicants should have had experience in a large undertaking employing E.H.V. and L.V. underground mains. Experience in fault location, supervision of jointing, cable laying, and the erection of overhead lines would be an advantage. Applicants should be qualified car drivers.

Salary, N.J.B. Schedule Class "F," Grade 11, £482 £498 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, within fourteen days of the appearance of this advertisement.

No. 6 (Hull) Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER (GOOLE) (VACANCY NO. 10/51)

Applicants should be experienced in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution networks, substation plant and ancillary apparatus. The successful applicant will be responsible to the District Engineer, and must be capable of preparing complete schemes and estimates. He will be required to reside in the Goole District and undertake standby duty.

Applicants should be Corporate Member of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary, N.J.B. Schedule, Class "D," Grade 5, £641 £655 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, within fourteen days of the appearance of this advertisement.

(H 463)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:

SHIFT CHARGE ENGINEER, Finchley Generating Station.

Salary in accordance with the revised N.J.B. Schedule, Grade 7, Class "B" (£492 to £518 per annum plus London Weighting).

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in electrical and/or mechanical engineering or equivalent and possess experience in the operation of generating stations.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than February 3, 1951. Envelopes should be endorsed "Shift Charge Engineer—Finchley."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (H 408)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

MAINTENANCE ENGINEER (ELECTRICAL)

APPLICATIONS are invited for the position of Maintenance Engineer (Electrical) at Longford Generating Station, Coventry. Salary and conditions of service will be in accordance with the N.J.B. Schedule, Grade 6, Class "G," £707-£737 p.a., and the post will be superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applicants should have received a thorough technical and practical training followed by considerable experience in testing protective gear, maintenance of alternators, transformers, switchgear and associated equipment and be capable of taking control of the Electrical Maintenance Staff. Preference will be given to candidates who are associated members of a recognised institution or possess similar qualifications.

Applications should be submitted on the official form, which can be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than February 5, 1951.

W. S. BURGE,
Divisional Controller.
(H 359)

SOUTHERN ELECTRICITY BOARD

No. 3 (Portsmouth) Sub-Area

ASSISTANT DISTRICT COMMERCIAL OFFICER, ALDERSHOT

APPLICATIONS are invited for the position of Assistant District Commercial Officer in the Aldershot District of the No. 3 (Portsmouth) Sub-Area. The provisional salary will be £600 per annum, subject to adjustment by the appropriate negotiating machinery, with conditions of service as prescribed from time to time.

Candidates should have a sound knowledge of rural development and must possess a comprehensive knowledge of estimating for various types of wiring installations. They must be fully conversant with all aspects of the commercial side of the electricity supply industry.

The successful applicant will, subject to certain conditions, be required to contribute to the staff superannuation scheme, membership of which is compulsory.

Applications, on forms to be obtained from the Sub-Area Secretary, should be returned to him at Lower Drayton Lane, Cosham, Portsmouth, in envelopes endorsed "Assistant District Commercial Officer, Aldershot," within fourteen days of the publication of this advertisement.

F. W. KEMPTON,
Secretary.
(H 447)

LONDON ELECTRICITY BOARD

DEMONSTRATORS (FEMALE)

APPLICATIONS are invited for positions as Demonstrators at West Ham, Leyton and Woodford. Possession of E.A.W. or similar certificate essential. Experience in conducting demonstrations and a knowledge of domestic electrical appliances an advantage.

Salary in accordance with the National Joint Council (Administrative and Clerical Grades) agreement, Grade I, £325 to £420 per annum inclusive, commencing salary being fixed according to qualifications and experience.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned within seven days. Please enclose addressed foolscap envelope and quote reference EST V 1144 T on envelope and all correspondence. (H 405)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

APPOINTMENT OF DEPUTY POWER STATION SUPERINTENDENT, SUNDERLAND POWER STATION

APPLICATIONS are invited for the position of Deputy Power Station Superintendent at Sunderland Power Station.

Applicants should have received a thorough technical and practical training and have wide experience in the operation and maintenance of generating plant. The successful applicant will be expected to reside within a reasonable travelling distance of the power station.

The salary for this appointment will be in accordance with the National Joint Board Schedule "A," Grade 9, Class "F," (£827 to £865 per annum).

Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be made in writing, stating age and giving full particulars of education, qualifications and experience to Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne 1, to arrive not later than February 6, 1951. (H 458)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Northmet Sub-Area 4/51

DEPUTY SUB-AREA MANAGER—SUB-AREA HEADQUARTERS—SOUTHGATE

The Sub-Area covers approximately 705 square miles and supplies 468,500 consumers. The annual consumption for the year ended March 31 last was 1,505,987,187 units and the maximum demand 428,699 kW.

Candidates should have had extensive experience in the management of large urban and rural undertakings.

The salary will be a provisional figure of £1,800 per annum.

Application forms may be obtained from the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Cannon Hill, Southgate, N.14, and when completed the forms should be returned by noon on Monday, February 5, 1951.

Northmet Sub-Area 7/51

ASSISTANT COMMERCIAL ENGINEER—COMMERCIAL REFRIGERATION

Applicants should have theoretical knowledge of refrigeration and an appropriate technical qualification would be an advantage. The full requirements of the post will normally include practical experience in the operation and maintenance of all classes of refrigeration equipment, designing and layout of commercial plant, preparing specifications, estimates and supervising the installation and setting to work of the equipment.

The provisional salary is up to £600 per annum, depending on qualifications and experience.

Application forms may be obtained from the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Cannon Hill, Southgate, N.14, and when completed the forms should be returned by February 9, 1951.

Fens Sub-Area 5/51

DEMONSTRATOR—HUNTINGDON

Applicants should have had Domestic Science training (and should preferably hold the E.A.W. Certificate), including electrical housecraft, and should be competent to plan and give cookery demonstrations, including lectures, and advice to consumers on the utilisation of electrical appliances. Previous experience in an Electricity Service Centre is desirable.

The salary and conditions of service will be in accordance with Grade 1 (£310 by £20 to £390) of the National Joint Council Agreement dated March 23, 1950.

Applications should be addressed to the Manager, Huntingdon District, Eastern Electricity Board, Market Place, St. Neots, Hunts, so as to arrive within 10 days of this notice.

Both future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme, and may be required to pass a medical examination.

Applications, in writing, stating age, qualifications, experience, details of present employment and salary, together with the names of two referees, should be addressed to the Managers concerned. (H 462)

NORTH WESTERN ELECTRICITY BOARD

No. 3 Sub-Area

APPOINTMENT OF THIRD ASSISTANT ENGINEER (MAINS PLANNING AND CONSTRUCTION)

APPLICATIONS are invited for the appointment of a Third Assistant Engineer (Mains Planning and Construction) at the No. 3 Sub-Area Headquarters, Union Street, Oldham.

Applicants should have had experience in the planning, construction and operation of large industrial, residential and rural high voltage and low voltage networks, including both overhead lines and underground cables, and should be capable of estimating for and supervising the construction of such work.

The salary for the post will be in accordance with Class "J," Grade 10, of the Revised National Joint Board Agreement, i.e. £609/£621/£633 per annum.

Corporate or graduate membership of the Institution of Electrical Engineers or exempting qualifications will be an advantage.

Applications, stating age, education, qualifications and experience, present post and salary, should be received by E. Binns, Esq., M.I.Mech.E., A.M.I.E.E., Sub-Area Manager, The North Western Electricity Board, No. 3 Sub-Area Headquarters, Union Street, Oldham, not later than Saturday, February 10, 1951. (H 444)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEER (Meters and Protection) required by the Central Electricity Board, Federation of Malaya for three years, with prospect of permanency. Salary (including expatriation pay) payable in local currency, equivalent at the present Government rate of exchange to £742 a year, rising to £1,652 a year. Commencing salary according to age and experience. Cost of living allowance equivalent to between £210 and £525 a year according to salary and dependents. Free passages. Liberal leave on full salary. Candidates between 24 and 35 years of age must have had a good general education and be corporate members or graduates of the Institution of Electrical Engineers or possess equivalent qualifications and have had sound practical experience in connection with the testing of meters, protective equipment, high and low voltage switchgear instruments and general testing work on a high voltage network, and be capable of planning and taking charge of a testing laboratory for an area roughly equivalent to a B.E.A. Sub-Area.

Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M25727B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (H 469)

SOUTH EASTERN ELECTRICITY BOARD

Dorking District

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER

SALARY of £594 to £616 per annum under N.J.B. Schedule, Class "D" Grade 6. Superannuation will be arranged. Applicants should have experience in the preparation of specifications and estimates for domestic, commercial and power installations, tariffs, control of showroom activities, consumers' record systems, installation work and supervision of staff.

Application forms obtainable from S. Gill, A.I.E.E., Dorking Manager, South Eastern Electricity Board, 56 South Street, Dorking, to be returned by February 5, 1951.

A. L. BURNELL,
Secretary.

January, 1951. (H 461)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

RESIDENT ENGINEER

APPLICATIONS are invited for the appointment of Resident Engineer to the Trinidad and Tobago Electricity Commission.

The Commission has under construction a new power station at Penal, consisting initially of two 5,000-kVA turbo-alternator sets with two water-tube boilers and ancillary equipment, which will be interconnected through a 66-kV transmission line with the Port of Spain power station of 19,900 kVA capacity. A diesel engine power station is to be constructed on the island of Tobago.

The engineer appointed will be responsible for the supervision of construction of the complete power station plant and buildings, including water-tube boilers, turbo-alternators, pipework, switchgear, and auxiliary equipment, together with machine and building foundations and super-structure.

Applicants must not be more than 45 years of age and must be fully qualified engineers, with considerable experience in the work outlined above.

The salary of the appointment is in the scale $6,480 by $240 to $6,960 per annum (£1 equals $4.80 B.W.I.), equivalent to £1,350 by £50 to £1,450 per annum), subject to satisfactory service.

Furnished quarters at moderate rentals or a rent allowance in lieu are provided under the Commission's Regulations.

Free passages are provided for the officer and family not exceeding four persons.

An outfit allowance of $288 (£60) will be granted on first appointment.

The appointment is subject to an agreement for a period of three years, and medical examination by the Commission's medical adviser.

Applications, endorsed "Resident Engineer, Trinidad," stating age, marital status, family, nationality, general and technical education, qualifications and experience, and full particulars of appointments held, with references, to be submitted to the undersigned within 21 days from the date of this advertisement.

PREECE CARDEW & RIDER,
8 and 10 Queen Anne's Gate,
Westminster, S.W.1. (H 470)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Suffolk Sub-Area 2/51

DISTRICT SENIOR CLERK—Ipswich District

Applicants should have had appropriate experience in accountancy and clerical work, including that relating to consumers' accounts, stores control, costing and invoicing, wages and general office routine. The appointment will be graded in accordance with the National Joint Council salary agreement dated March 23, 1950. Grade 6 (£630 by £25 to £705) a year.

Applications should be addressed to the District Manager—Ipswich, Eastern Electricity Board, Russell House, Russell Road, Ipswich.

Chilterns Sub-Area 1/51

ASSISTANT ENGINEER—Commercial Refrigeration—Bedford

Applicants should be competent to deal with all types of commercial refrigeration enquiries, prepare and submit quotations and conduct negotiations with the users if necessary, and to supervise the installation and setting to work of the equipment. He must also be competent to supervise the maintenance of all types of refrigeration equipment. Ability to drive a car is essential.

The provisional salary is up to £600 per annum depending on qualifications and experience.

Applications should be addressed to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford.

Chilterns Sub-Area 102/50

SENIOR SERVICE CENTRE ASSISTANT (Male), Hemel Hempstead

The successful candidate will be responsible for the efficient supervision of the service centre and should be experienced in matters relating to tariffs, installation and maintenance service, hire purchase facilities, etc. Previous experience in a service centre and a knowledge of window display and exhibition work is desirable.

The salary will be in accordance with the National Joint Agreement dated March 23, 1950. Grade 3 (£450 by £20 to £510 per annum).

Applications should be addressed to the District Manager—Hemel Hempstead, Eastern Electricity Board, 44, The Marlowes, Hemel Hempstead.

Chilterns Sub-Area

DISTRICT SENIOR COMMERCIAL ASSISTANT—Watford District

Applicants should have had wide commercial and sales experience to take charge of the sales and development of the Watford District and the two service centres, one in Watford and the other in Rickmansworth. The salary will be in accordance with the National Joint Council Agreement dated March 23, 1950. Grade 5 (£570 by £20 to £630 per annum).

Applications should be addressed to the District Manager, Eastern Electricity Board, The Parade, Watford

Northmet Sub-Area

ASSISTANT COMMERCIAL ENGINEER, Sub-Area Headquarters—Southgate N.14

Applicants should be Corporate Members of the I.E.E. or hold a qualifying exemption, and by training and experience be thoroughly conversant with general commercial practice. A knowledge of designing illumination schemes for offices, factories and other buildings, and street lighting is preferred. The salary for this appointment will be £727 per annum, plus London Allowance, Class "M," Grade 10, and conditions of service will be in accordance with the N.J.B. Agreement.

Application forms may be obtained from the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Cannon Hill, Southgate, N.14, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

Both future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme, and may be required to pass a medical examination.

Applications, in writing, stating age, qualifications, experience, details of present employment and salary, together with the names of two referees should be addressed to the Managers concerned so as to arrive not later than 14 days from the appearance of this notice. (H 394)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

LONDON ELECTRICITY BOARD

DRAUGHTSMEN

APPLICATIONS are invited for the above position in the North Eastern Sub-Area. Initially the successful applicants will be based at Romford Road, Stratford, E.15.

Applicants should have had a good general education and drawing office experience, preferably on mains records.

Pending grading of the post under the National agreement of the appropriate negotiating body, the salary will be within the range £300-£500 per annum, according to qualifications and experience.

Application forms obtainable from Establishments Officer, 46 New Broad Street, London E.C.2, to be returned duly completed within seven days. Please enclose foolscap envelope and quote reference EST/V/1049/T on envelope and all correspondence. (H 404)

CITY OF MANCHESTER

Airports Department

MAINTENANCE ENGINEER

APPLICATIONS are invited from suitably qualified persons for the above post. The salary and conditions of service will be in accordance with Grade A.P.T. V(a) of the National Joint Council Scales, i.e. £550 rising by £30 annually to £610 per annum.

Details of the appointment and forms of application may be obtained from the Acting Airport Manager, Ringway Airport, Manchester, on receipt of a stamped addressed envelope, and the application form should be returned to the same address by February 5, 1951. Canvassing is prohibited.

PHILIP B. DINGLE,
Town Clerk.
(H 455)

A CONTRACT ENGINEER is required for a permanent post with an old established electrical contracting company in Newcastle-on-Tyne, with experience in overhead and general installation work. Proved organising ability, experience in supervision of staff, preparation of specifications and tenders are essential. State age, experience and salary required. Car is provided. Applications must be received by first post February 12, 1951. —Apply, F. Reid, Ferens and Co. Ltd., Orchard Street, Newcastle-on-Tyne. (H 426)

A MANAGER required for Sales Department of progressive electrical firm, Cambridge. Previous experience of electrical appliances necessary together with capability for organising live sales promotion. Permanent post with excellent prospects for right man with ultimate possibility of Directorship. Experience, commencing salary, age.—Box No. 2077, Electrical Times. (H 358)

ASSISTANT ELECTRICAL DESIGNER, B.Sc. 1st or 2nd class Hons. in Electrical Engineering. Experience of industrial electronic technique. Knowledge of electric traction desirable.—Applications, Personnel Manager, Electro-Hydraulics Ltd., Warrington, Lancs. (H 456)

ASSISTANT ELECTRICAL ENGINEER required for Iron and Steel Works. Applications, giving age, details of education, experience, positions held (with dates), and including photograph, should be submitted, together with salary required, to Box No. 2065, Electrical Times. (H 313)

Applications are invited for the following positions, for which first-class Engineers are required:

ELECTRICAL CONTRACTING ESTIMATORS
Accustomed to large modern types of Industrial and Commercial Electrical Installations.

OUTSIDE PLANNING AND SUPERVISING ENGINEERS
For Electrical Contracts, having wide experience all types Electrical Installation.

COMPETENT JOURNEYMAN ELECTRICIANS
Fully Skilled Industrial — Domestic Installations.

Apply to

LEE, BEESLEY & CO., LTD.,
6, WARWICK ROW, COVENTRY
(H 334p)

CANADA
ONTARIO

Large electrical company requires EXPERIENCED CIVIL, ELECTRICAL and MECHANICAL ENGINEERS, DRAUGHTSMEN and TECHNICIANS. Excellent opportunities. Call, or write, stating experience:

Dept. B., Ontario Immigration, Ontario House, Charles II St., London S.W.1. (H 418p)

ASSISTANT ELECTRICAL DESIGNER required with good experience in the design of induction motors. The position offers good prospects, good working conditions with superannuation scheme. Assistance in regard to housing will, if necessary, be given.—Applications treated in strict confidence should state details of general and technical education, together with practical design experience, to Ref. WN, Crompton Parkinson Ltd., Guiseley, Nr. Leeds. (H 417)

ASSISTANT ENGINEER required by large engineering organisation in East London area for capacitor design and development. 21-25 years of age. Good opportunities for advancement. Degree or Higher National Certificate. Electrical.—Write, stating age and qualifications, to Box No. 3009, Electrical Times. (H 464)

BRITISH Railways (Southern Region). ELECTRICAL ENGINEERING ASSISTANTS are required for power supply and distribution. Applicants should not be more than 30 years of age and should have reached Matriculation standard in general education. Applicants should also have sound technical training and have reached a standard of not less than that of the Higher National Certificate in Electrical Engineering or equivalent. Practical engineering workshop training will be an advantage. Commencing salary £255 to £480 per annum according to age.—Applications, in writing, to be addressed to Mechanical and Electrical Engineer, 15 St. Thomas Street, London Bridge, S.E.1. (H 454)

COSTING CLERK (male) wanted in electrical contractors office, London S.E.1. Pricing installation materials, checking invoices, etc. Permanent appointment. Commencing salary £300 p.a. 5-day week.—Box No. 2097, Electrical Times. (H 420)

DRAUGHTSMEN. Britain's leading design consultants and contractors require urgently Senior Switchgear Draughtsmen, also Juniors to train as Switchgear Draughtsmen. Good salaries and prospects of advancement for suitable applicants. Pension scheme.—Write in confidence, quoting reference E.T., to John A. Smith Ltd., 24 Lichfield Street, Wolverhampton. (H 335)

DRAUGHTSMEN AND ENGINEER DESIGNERS required, preferably with experience in any branch of high tension and low tension electrical switchgear or electrical control gear, also applications from good mechanical draughtsmen and designers are invited.—Apply, quoting "Switchgear," to Staff Manager, General Electric Co., Ltd., Witton, Birmingham 6. (H 442)

ELECTRICAL ASSISTANT required with practical experience in electrical installation (contracting) work. Applicants should be aged 30-40 years and have had estimating and supervisory experience, minimum technical training to O.N.C. (Electrical). Duties will comprise the preparation of estimates, and working layout drawings for power and lighting systems. Permanent position with contributory pension scheme.—Applications, stating age, qualifications, experience and salary required, to Box No. 2085, Electrical Times. (H 383)

ELECTRICAL DRAUGHTSMEN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or Associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements, pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box 3371 at 191 Gresham House, E.C.2. Applicants without above requirements will not be considered. (H 437)

ELECTRICAL DRAUGHTSMAN urgently required for diagrams and cabling of power stations and substations up to 132 kV. H.N.C. standard necessary and works apprenticeship preferred. State full details and salary requirement. Stable post, London office. Pension scheme. Salary according to experience.—Write Box 215, c/o Walter Judd, Ltd., 47 Gresham Street, E.C.2. (H 438)

ELECTRICAL FITTER required for full-time maintenance of a.c. and d.c. lifts and cranes. Specialised experience in this field is essential. Age 25-40 years.—Applications should be made in writing to Personnel Manager, Boots Pure Drug Co. Ltd., Nottingham. (H 425)

ELECTRICAL OR CIVIL ENGINEER required as chief assistant in large organisation carrying out overhead line construction work. Must have experience in design and field work. Good prospects and superannuation.—Write, in confidence, to Box No. 2073, Electrical Times, giving full particulars and salary required. (H 355)

ELECTRICAL ENGINEERS, with experience of payment-by-results, time study and rate fixing, are invited to apply for a Senior Work Study Officer vacancy in connection with the application of incentive schemes to electrical maintenance and instrument work. Candidates must have had wide practical engineering experience and have obtained H.N.C. or equivalent. The vacancy is in Birmingham, and carries a starting salary of between £700 and £800 per annum, according to age and experience.—Write, stating age and giving full particulars of qualifications and experience, to: Box No. 3013, Electrical Times (H 471)

ELECTRICAL ENGINEER/DRAUGHTSMAN, 22-26 years, required West Midlands. Must hold, or about to sit for Higher National Certificate and have served full apprenticeship, including drawing office training. Training in motor and automatic switchgear application preferred. Give full details both present salary and references. Compulsory pension scheme applies to present vacancy. Canteen facilities available.—Box No. 3015, Electrical Times. (H 472)

FERRANTI LIMITED invite applications for senior appointments of graduate engineers with industrial experience in the design of electricity meters. The posts to be filled carry senior responsibility with excellent prospects, generous salary and pension.—Application forms from the Staff Manager, Ferranti Limited, Hollinwood. Please quote reference M.E. (H 324)

Amended Advertisement

FOREMEN required by the Southern Electricity Board, Engineering Department, Waterloo Road, Uxbridge. Applicants should possess a good experience in the erection, installation and maintenance of outdoor and indoor substation plant and equipment, operated at voltages up to 33,000 volts and the ability to control men. A knowledge of overhead lines and/or cable work and the ability to drive a vehicle would be considered an advantage. Rates of pay and conditions of service to be governed by the National Joint Industrial Council Agreement dated July 20, 1949. Applications, stating full details of qualifications, experience, age, etc., should be addressed to the Sub-Area Engineer, Southern Electricity Board, No. 1 (Southall) Sub-Area, Waterloo Road, Uxbridge, Middlesex, not later than January 26, 1951. *Interviews will take place on January* 31, 1951, *commencing at* 10.30 *a.m.* (H 477)

JUNIOR DRAUGHTSMAN required for work on light steel structures, aged 18-23. Salary up to £390 per annum, according to age and experience. Good prospects. Five-day week. Pension Fund. Canteen.—Write, Box No. 7736, c/o Whites Ltd., 72 Fleet Street, E.C.4. (H 413)

JUNIOR DRAUGHTSMAN required, 21 to 24 years. Some experience of small mechanical details for radio and television. Five-day week. Good prospects and working conditions.—Write Box No. 3001, Electrical Times. (H 432)

JUNIOR ENGINEERS having good Honours degree, mechanical or electrical, are required by Merz and McLellan in connection with large-scale electric power supply and other work for which they act as Consulting Engineers. Those who have already had practical training would have an advantage but others might be accepted for training. Commensurate salary will be offered to those with exceptional qualifications and experience.—Particulars, with covering letter in applicant's handwriting, should be sent to Merz and McLellan "Milburn," Esher, Surrey. (H 440)

LARGE manufacturing firm, producing electric cookers, domestic appliances, switchgear and fans, will shortly be appointing a SENIOR SALES REPRESENTATIVE for the North Staffordshire area. This important position is a permanent and progressive one and carries with it a retiring pension. Only men of good education with sound electrical background, knowledge of the products and actual sales experience are invited to apply in writing giving full details of experience and salary required, to Box No. 3011, Electrical Times. (H 468)

REPRESENTATIVE required Scotland (Eire could be included) for well-known manufacturer, especially l.t. switchgear. To call on wholesalers, electricity boards. Car an advantage but not essential. State age, experience and remuneration required.—Barries, King Street, Brighton. (H 428

OLD established British cable manufacturers require SALES ENGINEERING ASSISTANTS, single, preferably with some technical knowledge, for their Indian and Pakistan branches. Commencing salaries, including the current Dearness Allowance, approximately £950 per annum.—Applicants should write giving full particulars of education and experience to Box No. 3007, Electrical Times. (H 453)

OIL Refinery Contractors require a qualified ENGINEER to be responsible for specifying and selecting all types of pumps, motors, turbines, compressors, etc., used in the refining industry. Applicants should have had past experience of such equipment, particularly application of process type centrifugal pumps in the petroleum industry.—Write fully, Foster Wheeler Ltd., 3 Ixworth Place, London S.W.3. (H 399)

POWER PLANT CHARGE ENGINEER required by major oil company for employment in the Middle East to operate a combined gas and steam turbine station where he will take charge of a shift. Applicants who should be under 30 years of age, must possess a Higher National Certificate in electrical engineering and have served an apprenticeship in the generation division of a power supply organisation undertaking power station control room operation, followed by experience as a boiler house or turbine room charge engineer. Attractive salary plus generous allowance in local currency designed to assist substantially in meeting cost of living, free passages, kit allowance, free medical attention, good leave arrangements, pension scheme.—Write, stating personal particulars and details of qualifications and experience, quoting Dept. F.13.F, to Box 3336 at 191 Gresham House, E.C.2. (H 415)

QUALIFIED ELECTRICAL ENGINEER, commercial experience essential, required for responsible permanent position Pakistan. Salary approximately £1,200 p.a. and appropriate expenses. Single man aged 30 to 35 preferred. Applicants must have sound knowledge theory and practice of power, transmission and distribution. Knowledge of line communication system an advantage. The post offers good prospects with old established company.—Apply Box No. 2081, Electrical Times. (H 366)

REQUIRED, fully experienced WINDER, and for general repairs to all types of electric motors. Five-day week. State rate required in writing.—John Phillips and Co. (Electrics), Ltd., India Pavilion, Exhibition Grounds, Wembley, Middlesex. (H 441)

SENIOR DRAUGHTSMAN required, age about 35 years, with experience of radio and television receiver design, also small mechanical details. Progressive pensionable post. Five-day week.—Apply Box No. 3003, Electrical Times. (H 433)

SENIOR ELECTRICAL DRAUGHTSMEN required capable of designing, with minimum of supervision, electrical engineering installations for all types of buildings.—Reply, stating experience, age and salary required, to J. Stinton Jones and Partners, Consulting Engineers, 21 Gloucester Place, London W.1. (H 354)

SENIOR ENGINEER required to take charge of Tendering Section in Sales Office of a large South-East London firm of Telecommunications Engineers. Applicants who should have trained on telecommunications engineering and have had at least three years' experience as a Design or Equipment Engineer on switching systems, must possess an engineering degree, Grad. I.E.E. or comparable qualifications. Practical knowledge of telephone instruments and switchboard design essential and a broad knowledge of automatic switching methods an advantage. The post is an interesting one which offers good scope for a man with drive and initiative. Salary according to qualifications.—Write, giving fullest possible details, to Box D.9997, A. K. Advertising, 212a Shaftsbury Avenue, London W.C.2. (H 436)

SENIOR STRUCTURAL DRAUGHTSMAN, with experience in light steel structures, required for work in London Office in connection with radio masts and towers. Pension Fund. Five-day week. Canteen.—Apply, stating age, qualifications, experience and salary required, to the Staff Officer, British Insulated Callender's Construction Co. Ltd., 21 Bloomsbury Street, London W.C.1. (H 421)

SHIFT CHARGE ENGINEER for Electricity Supply Undertaking in Bagdad. Applications are invited from suitably qualified engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW with medium pressure boilers. Salary £1,000 to £1,200 per annum, plus high cost of living allowance at present 18¾%, with a maximum of £300 p.a. Free house with heavy furniture will be supplied or a monthly house allowance of £12 in lieu. Three-year contract, renewable, with first class passage each way for successful applicant and family (if married). Three months leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first class leave passages being paid.—Box No. 2091, Electrical Times. (H 401)

SHOWROOM SALESMAN OR SALESWOMAN for high-class west Hertfordshire showrooms. Must be experienced in electrical domestic appliances, radio and television and experienced in sales and purchasing of electric light fittings. Flat available to suitable applicant, if required.—Write, stating age, salary required and experience, to J. W. Russell Ltd., 18 Queens Road, Watford. (H 424)

TECHNICAL ASSISTANT (ELECTRICAL) required for Central London office for the design and layout of factory electrification schemes including substations, h.t. ring mains, transformers, m.t. switchboards, cabling distribution boards, motors, starters and lighting. Applicants must be between 25 and 30 years of age and must hold the H.N. Certificate in Electrical Engineering. Preference to man holding the Graduate Examination of the I.E.E. Five-day week. Superannuation scheme. Salary according to experience. Successful applicant would have to be passed by the company's medical officer.—All applications (which should contain copies of two or more testimonials) will be treated in the strictest confidence and should be addressed to Personnel Division (PMD-5), Lever Brothers and Unilever Limited, Unilever House, Blackfriars, London E.C.4. (H 345)

TECHNICAL SALES AGENTS for Counties of Yorkshire, Nottinghamshire, Lincolnshire and Derbyshire. Advertiser is well-known company of fifty years standing, manufacturing magnetic separators and lifting equipment used in most trades and industries. Would combine well with strictly limited number of complementary representatives. State date established, whether principal or other staff possess engineering qualifications, names of other agencies held and other relevant particulars.—Box No. 2087, Electrical Times. (H 384)

THE British Electricity Authority, North Western Division, invite applications for the position of SHIFT CHARGE ENGINEER at Hartshead Generating Station, Stalybridge, Cheshire. The salary for the post, which is superannuable, will be £651/665/679 per annum, in accordance with Grade 7, Class "G," of the revised National Joint Board Agreement.

Candidates should preferably possess technical qualifications and have had modern H.P. boiler and turbine experience.

Applications, stating age, qualifications and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than February 2, 1951. (H 457)

THE BRUSH ELECTRICAL ENGINEERING CO. LTD., Loughborough, invites applications from experienced TRANSFORMER DRAUGHTSMEN. Excellent working conditions, canteen facilities, etc.—Applicants should write giving full details of training and experience to the Technical Director. (H 414)

WANTED for service in Northern Nigeria with A. O. Nigeria Ltd., an ASSISTANT STOREKEEPER, aged around 30, with thorough knowledge of electrical plant, especially in connection with spares requirements of B.T.H. and Allen West industrial type h.t. switchgear, M.V. welding plant and general armature winding equipment. A knowledge of G.E.C. (America) electrical equipment for large Dragline excavators would be of advantage. Salary offered, £50 per month with living allowance of £10 per month. Two-year tour with leave on completion of tour of four months away from mine on full pay. Provident fund and pension scheme are provided.—Applications, in writing, giving details of experience and references to be sent to A. O. Nigeria Ltd., 55-61 Moorgate, London E.C.2. (H 416

APPOINTMENTS WANTED

ADVERTISER, age 37, over 20 years' experience all branches, wishes to emigrate to Australia. Would be pleased to hear from British firms having vacancies in that country.—Box No. 2057, Electrical Times. (H 288)

A.M.I.E.E. (34) seeks suitable progressive appointment abroad, preferably in Malaya, Africa or South America. Previous industrial experience abroad.—Box No. 2089, Electrical Times. (H 385)

OUTSIDE SERVICE ENGINEER (39), owner-driver, lifetime experience plant, machinery, equipment, 2 year tech., 2 Govt. certs., A.I.P.R.E. Willing cover Home Counties or near. Specialist training welcomed. —90 Bensham Manor Road, North Croydon. Telephone: THO 2301. (H 466)

A CHARTERED ELECTRICAL ENGINEER, A.C.G.I., A.M.I.E.E., resident in London, desires change and seeks position of senior responsibility with scope for initiative. Sixteen years' first-class experience with leading manufacturers, home and abroad, in production, contracts, sales. Proved organising ability, experienced in general administration, supervision of staff, publicity, preparation and adjudication of comprehensive specifications and tenders.—Box No. 2051, Electrical Times. (H 282)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines), Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO. LTD., Haddington Street, Hove (Tel. 32996), electrical engineers and winding specialists. Distance no object. (F 739)

BARREL PLATING CAPACITY AVAILABLE. Cadmium, copper, tin, and electro-galvanizing.—Packer and Son, Sion Place, Clifton, Bristol 8. Phone 38368. (H 336)

CASTINGS. Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (H 268)

SMALL factory in Essex, having a surplus of female labour during the next six months, would undertake light assembly work, inspection, packing or similar light work at reasonable charges.—Box No. 2093, Electrical Times. (H 402)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installation, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

STEEL, ALUMINIUM, BRASS and other non-ferrous sheets, strip, bars, off-cuts. Any quantity, gauge, size. Immediate payment.—Grades Sheared Metal Co., Ltd., Green Lane, Hounslow, Middlesex. Telephone: Feltham 3274. (H 368)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (A 13)

WANTED, 275 to 300 kVA 400-230 V DIESEL GENERATING SETS. Advise where and when inspection can be made. Advise speed, switchboard, automatic voltage regulator, condition, make of engine, make of alternator, price.—Box No. 2095, Electrical Times. (H 419)

BUSINESS OPPORTUNITIES

A.M.I.E.E. visiting Austria early February will accept commissions. Highest references. Confidential. London.—Box No. 3005, Electrical Times. (H 450)

FOR SALE

CABLES & WIRE

CABLE. T.R.S., 4-core flexible, 14/0076. Brand new, £2 per 100 yds. Large quantities v.i.r. and t.r.s. at bargain prices.—Boyce, Weir and Co., 778 New Hey Road, Huddersfield. (H 327)

LARGE stocks P.I.L.C., Armoured and Unarmoured CABLES, suitable for mines and quarries, also light duty flexibles, users only.—Inquiries to Box No. 2059, Electrical Times. (H 305)

DOMESTIC APPLIANCES

IMMERSION HEATERS. Grubb 4 kW. No purchase tax. All lengths, 16 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed and immediate delivery. Write for illustrated brochure, latest lists and trade terms to distributors.—John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

ENGINEERING PLANT & MATERIALS

WELDING PLANT. Several Motor Generator Arc Welders, single, double and multi operator up to 600 amps. Input 400-440 V, 3-phase, 50 c/s. Also several single and double operator transformer arc welders. All modern units by well known makers. Attractive prices. Full details.—Write: Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 294)

GENERATING PLANT

ALLEN GENERATOR for sale, 125 kW, 250 V, d.c., 500 amps, driven by 200 h.p. vertical diesel engine, compressed air starting with compressor and slate panel, switchboard connections, tank. Inspect at works W. England.—F. J. Edwards Ltd., 359 Euston Road, London N.W.1. (H 411)

AUSTIN HIGGS 8 h.p. GENERATING SET, 230 V d.c. 5 kW, as new, £35.—F. Rawlings, 22 Cable St., London E.1. (H 474)

DIESEL ALTERNATOR SETS from stock: 400/440 V, 3-phase, 50 c/s, 167 kVA "Waukesha/G.E.C.," 1,000 r.p.m.; 150 kVA "Petter/Brush," 500 r.p.m.; 135 kVA "Blackstone/Metro-Vick," 500 r.p.m.; 150 kW "General Motors/Westinghouse," 1,000 r.p.m.; 100 kVA "Deutz," 1,000 r.p.m.; 69 kVA "Mclaren/Brush," 1,000 r.p.m.; 85 kVA "Meadows/McFarlane," 1,500 r.p.m.; 62.5 kVA "McLaren/Bruce-Peebles," 1,000 r.p.m.; 50 kVA "National/Bruce-Peebles," 750 r.p.m.; 20 kVA "Lister/Metro-Vick," 1,000 r.p.m. Full details with price post free on request. —Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 292)

FOR sale, MOTOR ALTERNATOR, 500 watt, 200-250 V d.c. to 150-250 V a.c. 50-V controls, meters. Tel.: Hounslow 0331. (H 473)

GENERATOR FOR SALE, 220 V, d.c., 130 amps, with control panel. Driven by "Tangye" 34 b.h.p. single cylinder horizontal diesel engine. Inspection at works in W. England.—F. J. Edwards Ltd., 359 Euston Road, London N.W.1. (H 410)

GENERATOR SET, a.c., 230/250 V Met.-Vickers, SK. VA. No. 1 petrol-driven, for sale. Further details on request.—Norman Barry, Ltd., 79-80 Margaret Street, W.1. (H 439)

GENERATING SET

Two Screen Protected Direct Current Horizontal Spindle continuously rated GENERATORS, each 10 kW 110 V, as a compound wound machine, 10 kW 145 V as a shunt machine, speed 1,000 r.p.m. Provided with two end bracket-type grease lubricated ball and/or Roller bearings, terminal box for plain cable and free shaft extension, one 3-panel open flat back type SWITCHBOARD, two automatic starters, driven by two McLAREN RICARDO Diesel oil engines, type L.M.R. 2-cylinder, Nos. 30150 A and B, each complete with flywheel and guard, governor, water circulating pump, fuel filter, radiator with fan, and guard. Lubrication oil cooler mounted on radiator, lubrication oil filter, exhaust manifold silencer, exhaust pipe, air cleaner.

This equipment is new and unused, and was purchased in June, 1946, for the sum of £1,460, and has been carefully stored since its purchase, and can be inspected at Tallington, near Stamford, Lincs. Offers for the equipment should be made to

DOW-MAC (PLANT & TRANSPORT) LTD.
TALLINGTON, STAMFORD, LINCS.
Telephone: Peterborough 4501. (H 256p)

25-kVA MAWDSLEY ALTERNATOR, complete with Perkins diesel engine and control panel. Self-contained unit. Daily use. Full inspection. Excellent condition. £700.—Apply, Ford, 103 Mayors Walk, Peterborough. (H 478)

LIGHTING EQUIPMENT

ARROW switches. 1,000 Arrow No. 100002 P.M. switches for sale. Brand new. Offers.—Mitchell Electric Ltd., Tennant Street, Birmingham 15. (H 465)

ENGLISH Electric H.R.C. FUSES and SLYDLOK FUSES ex stock.—Ryness Ltd., 178 Stamford Hill, London N.16. (H 475)

PURLEY CHOKES AND BALLASTS. Our 80-w. Tapped h.p.f. Ballast, with Starter Switch-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57/6 each, subject.—F. W. Blanshard, Ltd. (Dept. ET), Purley, Surrey. Uplands 4818/9. (E 343)

METERS

A.C. and d.c. Quarterly and Prepayment METERS.—Electric Meter Co., Castor Road, Brixham. (H 332)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 51)

HOUSE SERVICE METERS, from 5s. Guaranteed two years.—Electric Meter Co., Castor Road, Brixham. (H 333)

METERS a.c. and d.c., new and reconditioned, all types. Quarterly, single and 3-phase, 3 and 4-wire, 2½ to 1,000 amps. Prepayment, single and double tariff, single, dual and triple coin, fixed and variable tariff. 2½ to 50 amps. M.D.I. Billiards Switches, Rent Collectors. Prices from 5/-, carriage paid. Two-year guarantee. Immediate delivery.—Illustrated catalogue from The Electric Meter Company, Castor Road, Brixham. (H 331)

MOTORS & STARTERS

A.A. ELECTRICAL CO.—FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Fairlands 8279, 67 Rothschild Road, W.4. (A 19)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. Edgware 8631/4. (A 476)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7232. (A 12)

A.C. and D.C. MOTORS, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). (A 10)

A.C. and D.C. Motors, Alternators, Generators, Generating Sets, Transformers, Welders, Plating equipment, Control Gear, Switchgear, Portable Electric Tools, etc. Write for current electrical stock list, post free.—Thos. W. Ward, Ltd., Albion Works, Sheffield (Phone 26311, ext. 347). (H 291)

BRAND NEW A.C. Motors from stock: 1/3 to 150 h.p. Slip Ring and Squirrel Cage, 400/440 V, 3-phase, 50 c/s at 750, 1,000 and 1,500 r.p.m., with or without control gear. Immediate despatch from stock. Attractive prices. —Full details post free from Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ext. 347). (H 293)

FOR ELECTRIC MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (C 296)

75 H.P. 1,500 r.p.m., 380/400 V, 3-phase, 50 c/s Crompton Slipring MOTOR, also Rails and Ellison Heavy Duty Starter (200 amps. Breaker), unused £260, also several B.T.H. Screen-Protected, S.C.R. Motors, 6 b.h.p., 1,500 r.p.m., 220 V., 346/380 V., 400/440 V., 3-phase. Inspection invited.—Box No. 2099, Electrical Times. (H 421)

ELECTRIC MOTORS, GENERATORS, TRANSFORMERS A.C. & D.C.
STARTERS, SLIP RING & D.C., SEMI-AUTOMATIC
Any voltage, new, short delivery, all types of revolving electrical power.
ELECTROPOWER COMPANY LIMITED
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Telephone: COLindale 4621/2. D 17p)

225 H.P. slip-ring MOTOR by A.S.E.A. 400/3/50, 485 r.p.m.
175 h.p. slip-ring MOTOR by L.D.M. 400/3/50, 720 r.p.m.
170 h.p. compensated Induction MOTOR by E.E.C. 400/3/50, 720 r.p.m.
150 h.p. 350 kVA synchronous Induction MOTOR by Mather and Platt, 400/3/50, 750 r.p.m.
135 h.p. S/C Induction MOTOR by E.E.C. 400/3/50, 589 r.p.m.
100 h.p. slip-ring MOTOR by G.E.C. 400/3/50, 725 r.p.m.
90 h.p. slip-ring MOTOR by G.E.C. 400/3/50, 725 r.p.m.
Two 85 h.p. slip-ring MOTORS by Holmes, 400/3/50, one 485 r.p.m., one 600 r.p.m.—George Cohen Sons and Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, near Leeds. Tel.: Pudsey 2241. (H 422)

SWITCHGEAR

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (C 175)

WALSALL 15 amp. 3-pin watertight SWITCH PLUGS complete 25/- each. Revo 6 way, 15 amp. double pole i/c FUSEBOARDS each way controlled by 5 amp double pole switch. £2 each.—Ryness Ltd., 178 Stamford Hill, London N.16. (H 476)

TRANSFORMERS & CONVERTORS

50 kVA Hackbridge TRANSFORMER, normal input 11,500 V 3-ph. 50 c/s with tappings plus or minus 2½% and 5%. Output voltage 400 3-ph or 230 V single ph. Price £80.—The Bifurcated and Tubular Rivet Co. Ltd., Aylesbury, Bucks. (Tel.: Aylesbury 1044). (H 409)

500—50 M.F. 275 V T.C.C. CONDENSERS, can type. Surplus to requirements. Offer considered for the whole or part. Samples sent upon request 7s. each.—Electro-Mechanical Supplies Ltd., 39 Queens Road, Coventry. (H 423)

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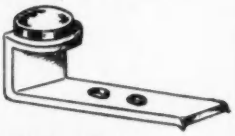

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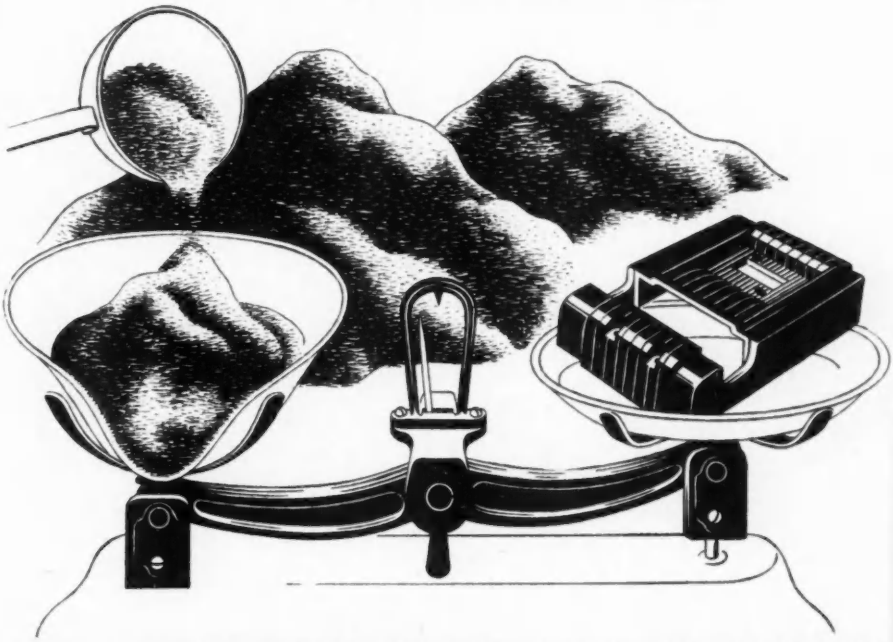

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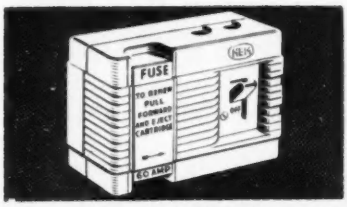

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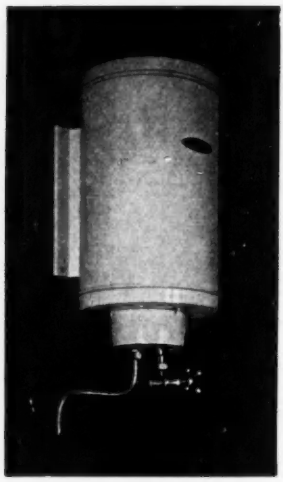

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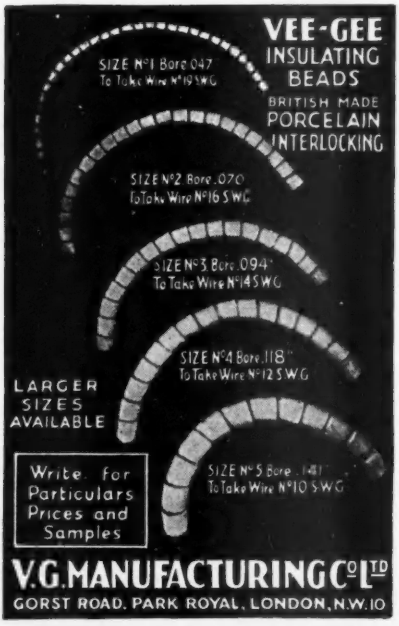

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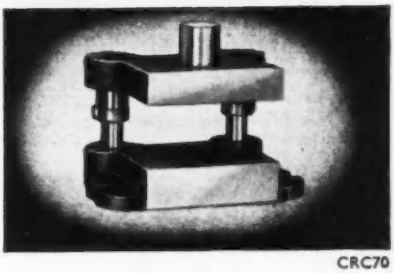

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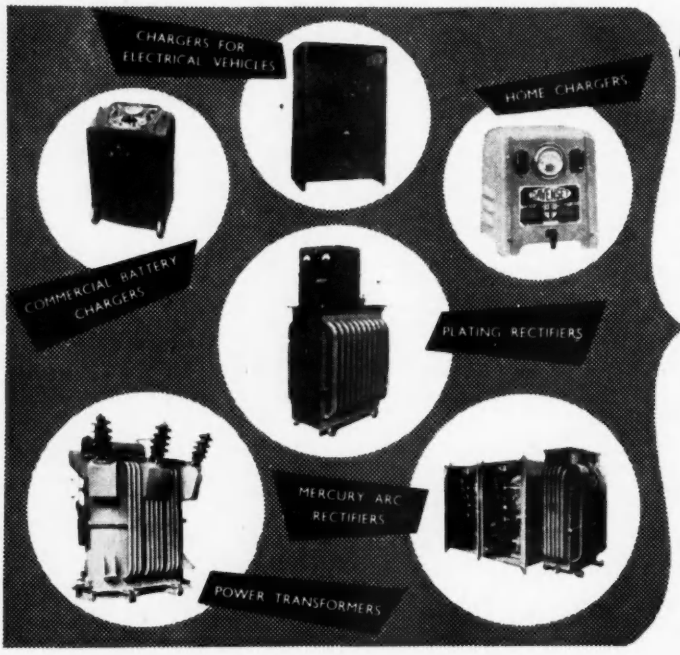

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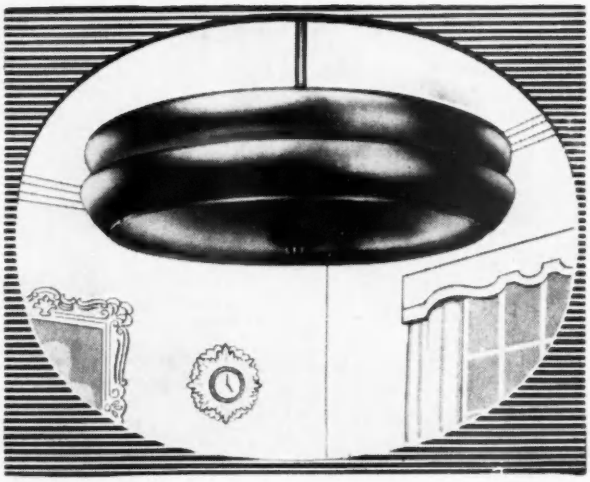

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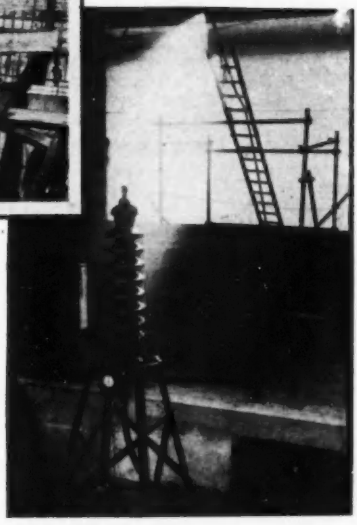

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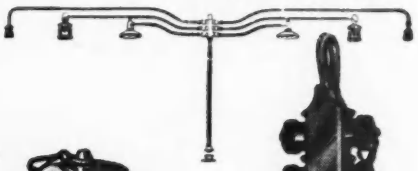

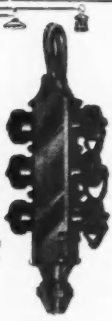
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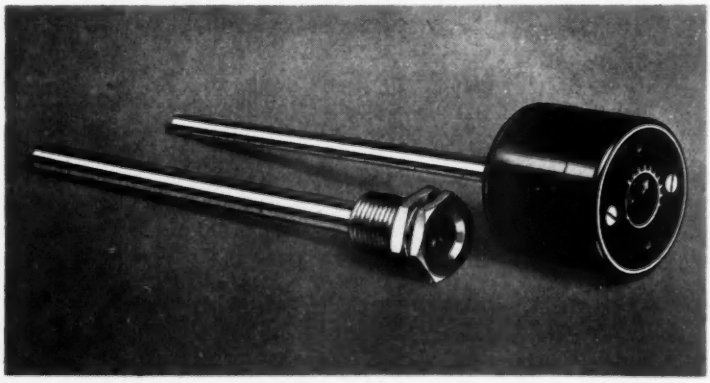

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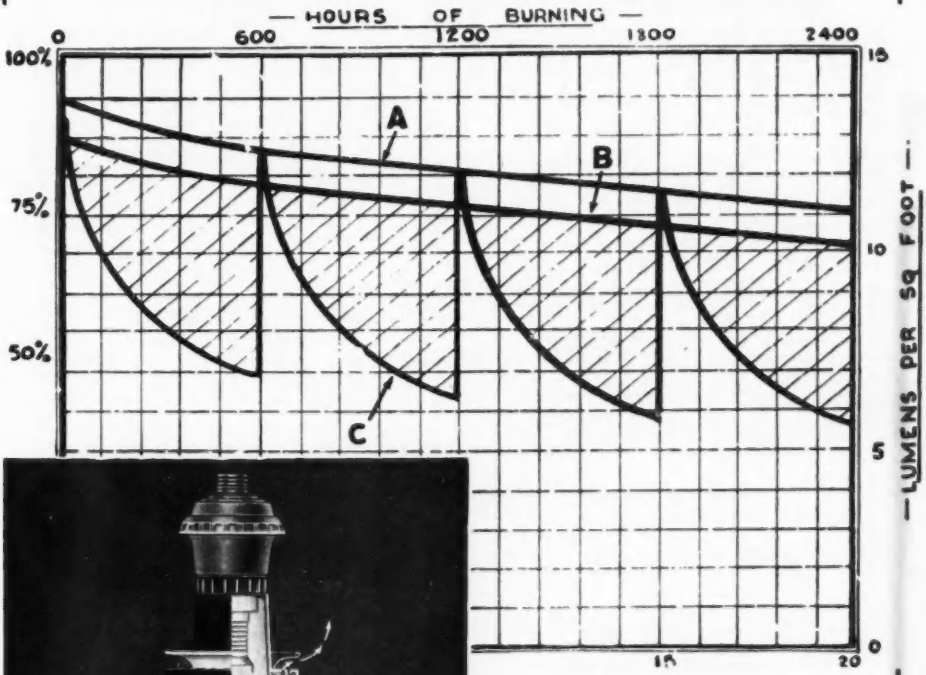

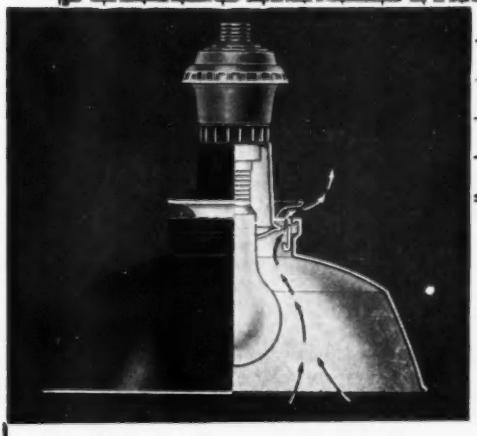

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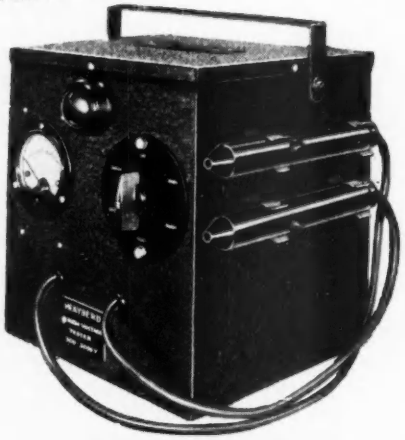

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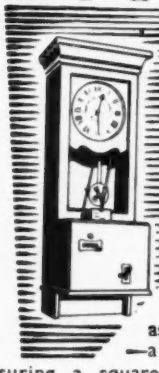

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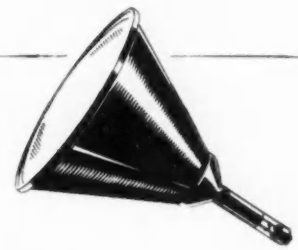

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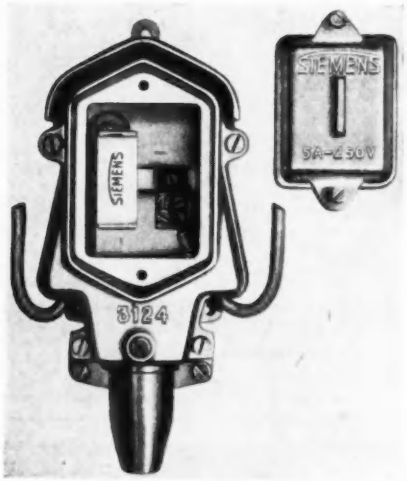


LIST Z176 sent on application

5 amperes 250 Volt

WEATHERPROOF

Cast iron case constructed in two halves to facilitate easy cabling.

Outgoing cables leave the box at the bottom to prevent ingress of water from condensation etc.

Fitted one porcelain fuse with H.R.C. fuse link and a neutral block.

Fuse links comply with B.S.S. 1361/1947. Category A.C.3. 250 volts.

Small and compact, suitable for fitting into base of lamp standard.

PRICE EACH

No. 3124 F.N. Fuse and Neutral **17/-**

No. 3124 2 F. Two Fuses . . **17/6**

Note the dimensions

Height 8¼" Width 4" Projection 2⅜"

15 Amperes 250 Volt

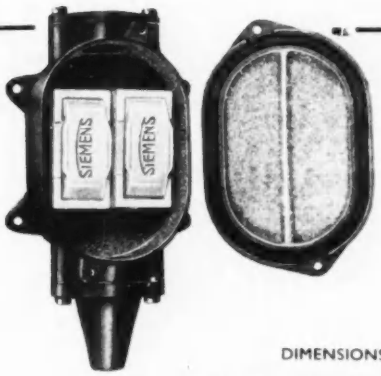
WEATHERPROOF

Cast iron case with external fixing lugs for wall mounting—also suitable for mounting inside standard.

Detachable plates or glands can be fitted top and bottom as required.

Fuses can be either rewireable type or H.R.C.

CATALOGUE No. Z146 sent on request.



DIMENSIONS

Height 6" Width 3⅜" Projection 2⅜"

Advt. of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38/39 Upper Thames Street, London, E.C.4
Branches at: Belfast Birmingham Bristol Cardiff Dublin Glasgow Leeds Liverpool Manchester Newcastle-on-Tyne Nottingham Sheffield

Lighting

Cat. No. 425
Lacent fitting in Plastic moulding of pleasing design with high illumination efficiency.

Cat. No. 422
Universal type Lacent fitting constructed to enable a varied number of conduit entries.

Cat. No. 420
Standard Lacent unit modestly priced, efficient and decorative in appearance.

by

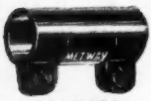
HEYES
of Wigan

LONDON: 21 Fitzroy Square, London W.1.
BIRMINGHAM (Midland Agent): F. G. Ketelbey, M.I.E.E., Gazette Buildings, Corporation Street, Birmingham.
AUSTRALIAN AGENT:
The Lawrence & Hanson Electrical Co., Ltd., 33 York Street, Sydney, Australia.

HEYES & CO. LTD., WATER HEYES ELECTRIC WORKS, WIGAN
dm HC 43

METWAY PRODUCTS
Registered Trade Mark

LUG GRIP CONDUIT FITTINGS



COUPLERS

INSPECTION ELBOWS

INSPECTION TEES

NOTE.—An application on your trade letter heading and a 6d. stamp to cover postage will bring you a copy of our 92-page **LIST OH/31/E.T.**

METWAY ELECTRICAL INDUSTRIES LTD.
KING STREET, BRIGHTON 1
Phone: Brighton 28366. Grams: Metway, Phone, Brighton

SWITCHGEAR SPECIALISTS
STATTER

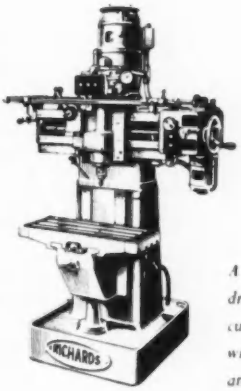
J. G. Statter & Co. Ltd., 82 Victoria Street, S.W.1

Instruction Chart
For dealing with apparent death from
ELECTRIC SHOCK
(*In accordance with H.O. Electy. Reg.* 29)
Mounted on strong board, varnished and corded for hanging.
Price 3/- plus 10d. postage (per single copy)
ELECTRICAL TIMES
Sardinia House
SARDINIA STREET · LONDON · W.C.2

In machine tools . . .

Where there's a handwheel there may be a job for an M-V motor

Increased horse-power per man, applied skilfully through special-purpose machine tools, is the certain way to improve production. Push-button control in place of manual operation cuts out time-wasting and tiring tasks, improves output and the quality of the job. M-V can provide suitable motors and control gear to drive any machine tool and can support them by the knowledge and experience of engineers who really understand the electrical problems of the machine tool industry.



A Richards vertical slot-drilling and keyway-cutting machine equipped with "M-V" motors and control gear.

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, TRAFFORD PARK, MANCHESTER, 17

Member of the A.E.I. group of companies

METROVICK *Motors for all Industrial Drives*

J/A004

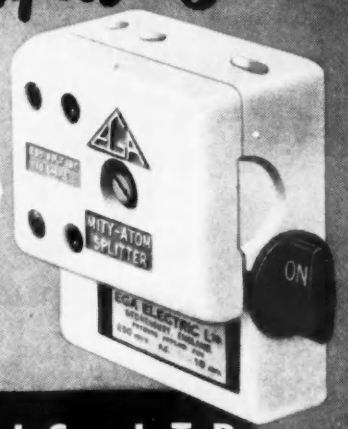
AN ADDITION TO THE *Mity Atom* RANGE

The NEW all porcelain, 10 amp, 2-way Splitter

★ Combined cover and fuse carrier, of plug-in type

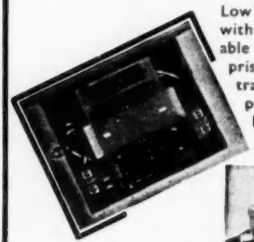
★ Easy installation and fuse replacement

★ Positive action from toggle-free mechanism



EGA ELECTRIC LTD
WEDNESBURY • STAFFS

LOW VOLTAGE TRANSFORMERS



Low Voltage Lighting Unit with lid removed. Suitable for m/c tools, comprising double-wound transformer with fused primary and secondary D.P. on-off switch, housed in steel case.

Low Voltage Portable Transformer suitable for hand-lamps, portable m/c tools, etc. Fitted with Reyrolle plugs and sockets and carrying handle.

We specialise in the manufacture of LOW VOLTAGE TRANSFORMERS to customers' individual requirements. Single or three-phase from 50 V.A. to 25 k.V.A.

JOHN DRUMMOND (ENGRS.) LTD.
23 Lochburn Road, Maryhill, Glasgow N.W.
Tel: Maryhill 1893

"EVOLITE"
PERSPEX TUBES AND CYLINDERS
Fabricating, Welding and Machining
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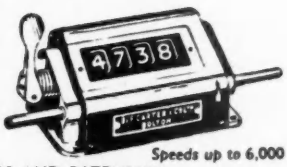
LONDON, W.10. Phone: LADbroke 1879/3709

RATCHET & REVOLUTION COUNTERS

PLEASE SEND FOR LEAFLET No. 18/6



Speeds up to 6,000 r.p.m

SOLE MAKERS AND PATENTEES:—
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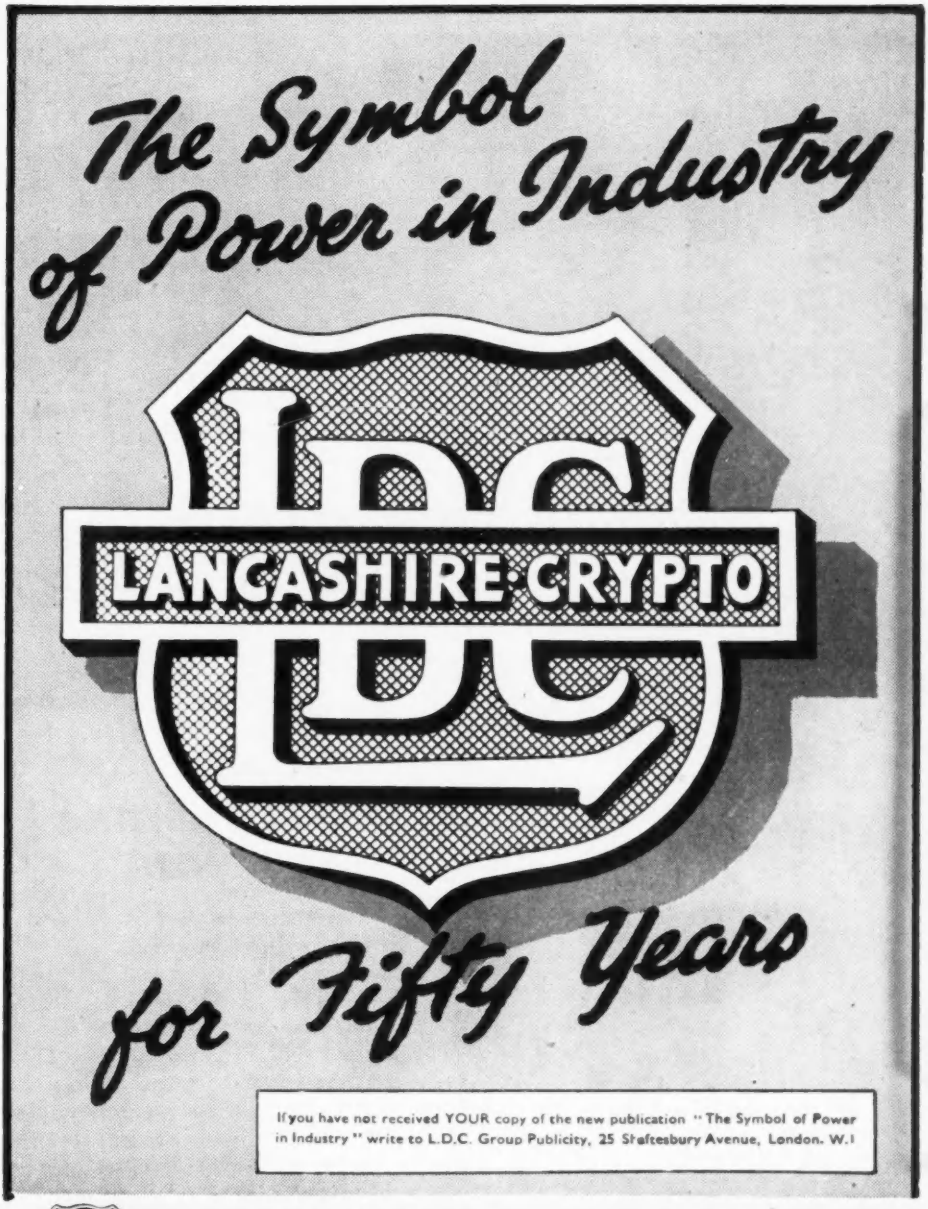
BOLTON, 9
Members of B.E.S.T.E.C. Organisation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Associated Companies:—

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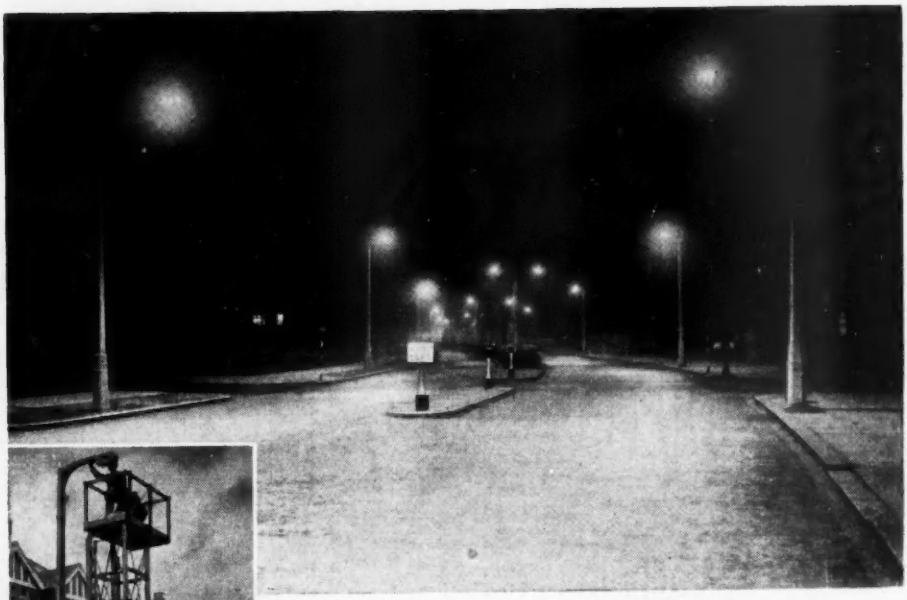
A comprehensive street lighting service . . .



(Top) Revo "Silverblue" lanterns mounted on Revo "Phidias" concrete columns at Altrincham.

(Centre and Bottom) Units of the Revo Street Lighting Erection Dept.

Revo

STREET LIGHTING EQUIPMENT

The Revo factories constitute one of the largest organizations in this country for the manufacture of Street Lighting Equipment. Complete installations can be carried out, from the initial planning of the scheme to the final erection of the equipment, and a staff of skilled engineers, using the most modern apparatus, is available for this purpose.

REVO ELECTRIC CO. LTD., TIPTON, STAFFS.

Printed in England for the Proprietors, THE ELECTRICAL TIMES, LTD., by SUN PRINTERS, LTD., London and Watford, Herts., and published at Sardinia House, Sardinia Street, London, W.C.2. January 25, 1951.

FAMOUS BIRTHPLACE

People with 35 years' experience of making electric domestic appliances are able to use their skill to the best advantage in this fine modern factory. There, with the best of raw materials, the most up-to-date plant, and plenty of space for efficient production lines, they produce washers and cookers which are sold with confidence and possessed with pride. The Parnall factory at Yate is the birthplace of Britain's best domestic appliances — finely designed and sturdily built.

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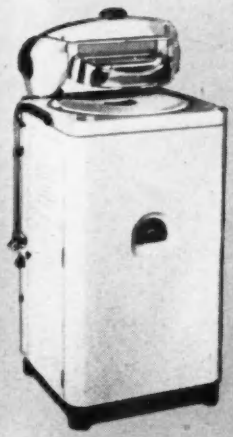


The exceptionally handsome new Parnall Electric Washer is the result of a careful survey of housewives' requirements. It handles a week's family laundry in one hour and among special features are the electric emptying pump, the very latest anti-corrosion treatment of metal parts and the storage recess for the Wringer.

☆

Among the advantages of this EC 12 cooker are rapid oven heating, enclosed grill, drop-down type balanced door, sunk switches and a heated drawer in the plinth, if required.

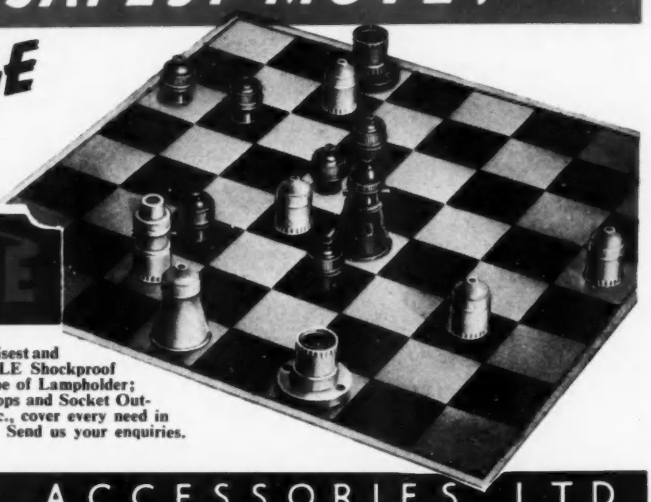
PARNALL

PARNALL (YATE) LIMITED · 43 PARK STREET · LONDON W1

YOUR SAFEST MOVE!

CHANGE TO-

NETTLE



For the man who looks ahead the wisest and safest move is to specify NETTLE Shockproof Electrical Accessories. Every type of Lampholder; a comprehensive range of Plug Tops and Socket Outlets; Ceiling Roses, Adaptors, etc., cover every need in domestic and industrial lighting. Send us your enquiries.

NETTLE ACCESSORIES LTD.

HARPER ROAD, WYTHENSHAWE, MANCHESTER

Feed water evaporators

SINGLE, DOUBLE & TRIPLE EFFECT

WITH VAPOUR RECOMPRESSION FOR HIGHEST EFFICIENCY.

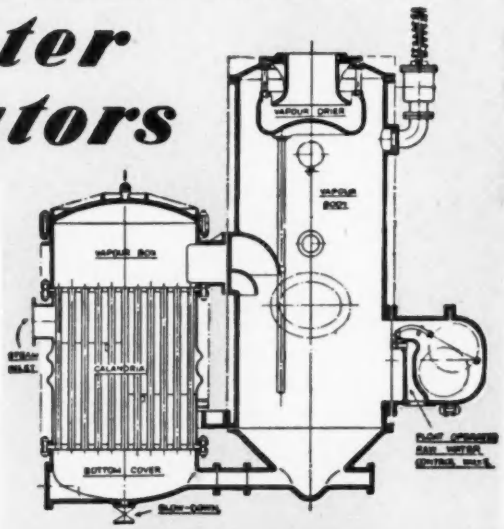
Low Vapour Velocity— High Condensate Purity

Ample Surface— Infrequent Cleaning

Straight Tubes— Easy Access

The drawing shows the sectional arrangement of a single effect Evaporator.

H104A



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